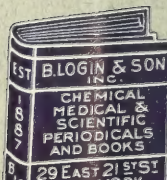
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TRANSACTIONS

OF THE

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

[Vol. 2]

Dr Hayes

NINTH ANNUAL MEETING.

NEWPORT, JULY, 1873.

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OF THE

American Ophthalmological Society.

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Dr. Charles J. Pardee	New-York,	New-York.
Dr. O. D. Pomeroy	"	"
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Dr. O. F. Wadsworth	Boston,	"
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Dr. E. Williams	Cincinnati,	Ohio.
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Total.....57.

HONORARY MEMBERS.

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Dr. Isaac Hays	Philadelphia,	Pennsylvania.
Dr. R. Hooper	Boston,	Massachusetts.
Dr. John Jeffries	"	"
Dr. E. Reynolds	"	"
Dr. C. Schweigger	Berlin,	Prussia.
Dr. George Wilkes	New-York,	New-York.

Total..... 7.

Whole Number.....64.

AMERICAN
Ophthalmological Society.

NEWPORT, *July* 17, 1873.

The Society met at the rooms of the Newport Exchange, 197 Thames Street, at 11 A.M.

The President, with a few introductory remarks, took the chair, and made allusion to the omission of the meeting in 1872, which was given up that the members might attend the session of the International Ophthalmological Congress in London, and alluded also to the fact that the next regular meeting of the Congress would occur in New-York in 1876.—Present:

The President, Dr. HENRY W. WILLIAMS,	Boston.
Dr. C. R. AGNEW, Vice-President,	New-York.
" ALTHOF,	"
" KNAPP,	"
" LORING,	"
" NOYES,	"
" POMEROY,	"
" DERBY,	Boston.
" HAY,	"
" WADSWORTH,	"
" DYER,	Philadelphia.
" THOMSON,	"
" STRAWBRIDGE,	"

Dr.	Miller,	Providence.
"	Rider,	Rochester, N. Y.
"	Green,	St. Louis.
"	Roosa,	New-York.
"	John Jeffries, Honorary Member,	Boston.

The President appointed a committee whose duties should be to receive applications for membership, to nominate officers for next year, and to choose the next place of meeting, namely, Drs. Roosa, Althof, Hay, Thomson, and Green.

Also a committee to prepare a bulletin, namely, Drs. Wadsworth and Rider.

The resignation of Dr. J. H. Hinton, of New-York, was received and accepted; also the resignation of Dr. A. D. Williams was confirmed.

The Treasurer read his report, which was referred to Dr. Dyer to be audited, and afterward reported to be correct and to be properly vouched for. The report was thereupon accepted and ordered on file.

The Nominating Committee recommended the following persons for membership:

Dr.	R. J. McKay,	New-York.
"	David Webster,	"
"	Charles J. Kipp,	Newark.
"	Charles J. Pardee,	New-York.
"	George C. Harlan,	Philadelphia.

They were all duly balloted for and declared elected.

The Business Committee presented a bulletin of papers, of which eight were read; and at 2 P.M. the society adjourned to reassemble at 8 P.M.

At the evening session, the minutes of the morning were read and approved.

The bulletin was taken up, and upon the reading of the sixteenth paper, by Dr. H. Derby, "on the Importance of a Record of all Operations for Extraction of Cataract, with some practical Suggestions," its subject matter was referred to a committee, consisting of Drs. Williams, Derby, Agnew, Knapp, and Noyes, to take action as they should deem fit, and report to the next session of the society.

The Nominating Committee reported the names of

Dr. GEORGE T. STEVENS, . Albany,
" J. J. B. VERMYNE, . . New-Bedford, Mass.,

who were duly balloted for and elected.

Dr. Althof made a communication on the proposed monument to be erected in Berlin to the late Professor Von Graefe. A subscription was taken up and handed to the President for transmission to the Berlin Committee.

After reading three more papers, and having referred all papers presented, to the Business Committee, the Society at 10 P.M. adjourned.

July 18, 1873.

Society met at 10.30 A.M. The minutes of the previous meeting read and approved.

The Nominating Committee then reported the following persons for officers for the ensuing year:

President, Dr. C. R. AGNEW, of New-York.

Vice-President, Dr. G. HAY, of Boston.

Recording Secretary, Dr. HENRY D. NOYES, of New-York.

Corresponding Secretary, Dr. H. ALTHOF, of New-York.

All of whom were on ballot elected.

They also recommended not to appoint a Committee on the Progress of Ophthalmology; that the place of meeting next year be Newport, on the third Thursday of July, as fixed by the By-Laws, at 10 A.M. These recommendations were adopted.

It was resolved that the Publishing Committee be composed of Drs. ROOSA, LORING, and the Recording Secretary; and that the assessment for the next year be $10; and that papers intended for publication must be put into the hands of the committee by September 1st.

The President elect made some remarks in accepting the office, and by the courtesy of the retiring President Dr. Williams, the Vice-President elect, Dr. Hay, then took the chair.

The Committee upon Tabulating the Records of Cataract Extractions reported that they had agreed upon a form, which was read and accepted, and they were authorized to have them printed and prepared for sale.

The bulletin was then resumed until it was completed, and all papers were referred to the Publishing Committee.

The choice of the rooms to be occupied by the Society at the next meeting was left for the Secretary to decide between the Newport Exchange and the Acquidneck House.

Minutes read and approved, and at 1 P.M. the Society adjourned.

HENRY D. NOYES, M.D.,
Recording Secretary.

As a supplement to the minutes, and giving official account of the American movement in aid of the Graefe monument, the following letter is inserted:

(Copy.)

15 ARLINGTON STREET, BOSTON, U. S. A.,
September 19, 1873.

Comité für das Gräfe-Denkmal, Berlin:

GENTLEMEN: The friends of the late Professor Von Gräfe having done me the honor of making me the American member of the Committee appointed to obtain a subscription for a statue to be erected to his memory at Berlin, I asked the assistance of several gentlemen residing in other American cities, and of the American Ophthalmological Society.

As the result of our efforts I have the pleasure of inclosing a draft on the Hamburg-Berliner Bank for two thousand two hundred and fifty Reichs-Marks, (about six hundred and twenty dollars.)

A list of the names of all who have subscribed is also inclosed; but we do not affix the amounts paid by each; as we wish that those who have given larger or smaller sums may have equal honor, as having contributed according to their ability.

Please to receive the assurance of my highest consideration.

HENRY W. WILLIAMS, M.D.

A CASE OF INTRA-OCULAR GLIOMA, IN WHICH THE DISEASE REMAINED LATENT FOR TWENTY MONTHS AFTER PERFORATION OF THE CORNEA. By O. F. Wadsworth, M.D., Boston.

T. F., 2 years and 11 months old, was brought to me at the City Hospital, August 2d, 1871. His mother stated that the left eye had been lost by inflammation some months previously, but had since remained quiet till ten days before. Then it began to be reddened, painful, and prominent, and the child had since refused food, slept little, and was rapidly losing flesh and strength. The lids were now swollen and reddened, the conjunctiva congested and somewhat chemosed, the bulb prominent. The cornea was small and completely leucomatous. The resistance felt on pressure seemed perhaps a little more tense than is usually the case in panophthalmitis, and the congestion and chemosis of the conjunctiva rather less than was to be expected if the quite considerable prominence of the globe were due to that affection; still the rapidity with which the symptoms had appeared, and the severity of the constitutional disturbance, served to make the diagnosis of panophthalmitis the most probable one.

With the object of diminishing tension and relieving pain, an incision with a Beer's knife was made across the cornea in the horizontal meridian, the wound being about $\frac{1}{2}''$ long, and $\frac{1}{3}''$ deep in the centre. The feel on cutting was that of a solid body, and nothing escaped from the wound. The probability of the presence of a tumor was at once evident, and the mother was advised that the eye should in such case be removed. For the next two days, she was to apply warm fomentations.

It may be as well to give here the more exact previous history of the case which was afterward obtained from the mother. The boy had been generally healthy. When he was six months old, the mother noticed a "speck on the sight of the left eye the size of a pin's head." No preceding inflammation had been observed. This "speck" remained about the same till he was fourteen months old; then the eye inflamed. He was then in a country town in New-York, and by the advice of a physician, alum curd and white of egg was applied for some four weeks. There was great swelling and much discharge, which gradually diminished. Not long after, he was brought home to Boston, and the eye, except for slight passing attacks of inflammation, remained quiet until ten days before I saw him. Confirmatory of this account is the fact that, on October 17th, 1870, he was seen by an oculist of this city, who diagnosed "atrophy of the globe," and again, November 30th, 1870, by another oculist, who found "chemosis of the conjunctiva of the left eye, the cornea barely visible and hazy." The chemosis was incised and a borax lotion ordered.

Two days after the first visit, the swelling and redness of lids and congestion of conjunctiva were much less; the globe was, however, quite as prominent and offered as much resistance to pressure, but it followed slightly the movements of the other eye. There had been no discharge from the wound. The pain, etc., continued.

Immediate removal was advised and acceded to. The patient was etherized, and conjunctiva and recti tendons divided as for enucleation; but before cutting the nerve, the finger was passed backward between Tenon's capsule and globe, and a tumor, posterior to the eye and attached to it, was felt. The tissues were then divided from the outer canthus to the edge of the orbit, and the whole mass of the tumor, so far as it could be made out, removed entire, the finger serving as a guide for curved scissors. The extra-ocular portion of the tumor was attached to the posterior third of the bulb, and seemed nearly as large as the bulb itself. It was enveloped in fatty tissue, and portions of the muscles were removed with it. The nerve was divided about $\frac{3}{4}''$ behind the globe; its cut surface was rather whitish, fatty looking, about normal size.

On examination of the orbit with the finger, a flattened oval nodule was felt under the outer portion of the roof, apparently encapsuled. This was supposed to be the lachrymal gland, and was not removed. Nowhere else in the orbit was any nodule to be felt, and the tissues appeared to the touch normal. The bleeding was not excessive and was readily controlled by ice. A sponge compress was applied over the lids.

The boy had a good night, and the next morning was sitting up in bed enjoying a picture-book, and quite free from pain. In the afternoon he was taken home. The parents were warned of the likelihood of a recurrence of the tumor, and asked to inform me if any symptoms appeared. The wound healed readily, and for eight or nine days following the operation, the child seemed quite well and had a good appetite. Then he began to complain of headache, had anorexia, nausea, and vomiting. August 16th, two weeks after the operation, he was brought again to the hospital. There was no swelling of the lids, the wound was healed, the orbit seemed rather full. The headache, etc., persisted.

On August 28th, the father brought him to my office in the evening. The three days previous, his appetite had been fair, and he had vomited but once, but he had seemed dull for several days, and especially on that day, and had kept his hand to his head much of the time, though not complaining of pain. The father had noticed also that the sight of the right eye seemed growing dim, and that there was some prominence of the left lids. The left eyelids were slightly pushed forward and the orbit was filled with an elastic mass. The conjunctival surface was unbroken. The right pupil was dilated, as in paralysis of the sphincter, and reacted very little to light. The child was a little uneasy and frightened, and ophthalmoscopic examination was difficult. A few glances at different parts of the fundus were, however, obtained, but revealed nothing abnormal. Going out of the room and through the front door, holding his father's hand, he walked rather hesitatingly, and put out his other hand, as if groping to assist his vision.

The next ten days he had more or less vomiting, his appetite was poor, and he took little but milk. During the first part of this time he moved about the room only by groping ;

later, lay still most of the time and rarely spoke unless spoken to. When he did speak, he appeared sensible. He became peevish, complained two or three times of dizziness, and had a few slight "spasms," "stiffening himself out," sometimes after such an attack complaining of pain in his head for a few moments; at night he was restless.

By September 7th, the eyelids were pushed forward by the tumor of the orbit so as to reach a little beyond the level of the brow, and formed a rounded projection below it about the size and shape of the larger end of a hen's egg; the superficial veins in the upper lid enlarged. The right pupil was large and immovable, and vision wanting entirely.

The tumor increased in size, the lids became more distended, and fleshy granulations appeared between them, bleeding at rare intervals, but never to large amount. He ate scarcely any thing, but drank a variable amount of milk, and some days he was free from vomiting. September 16th, there was a small movable swelling over the posterior edge of the ramus of left lower jaw, a little above the angle. He had had no dejection for several days, and, his mother thought, did not pass his urine. The descending colon was found filled with hard rounded masses, and the bladder distended almost to the umbilicus, but there was no tenderness on pressure and no complaint of pain. A hot bath followed by hot fomentations relieved the bladder, and he afterward passed his urine pretty well, but only when he was held up; otherwise, he would go the whole day without micturition. Enemata were ordered, but only one was given, which had no effect, and as he complained of its paining him, his mother did not repeat it. For two weeks longer the constipation continued, and the whole colon became filled with hard masses; then spontaneous daily dejections took place for a while and the distention of colon much diminished. Toward the end of September he seemed rather brighter and stronger, occasionally asked to be taken up and sung to, and often hummed to himself while lying on the lounge. Rarely he complained of pain in the brow over the tumor. He answered clearly when spoken to, but was peevish and unwilling to be touched, and sometimes cried out at night as if in pain, though generally sleeping pretty well.

By the 7th of October, he had become more listless and did not mind touching and washing as before; but he was still sensible when he spoke, and strong enough to sit up in his father's lap. The vomiting had increased, with some retching, appetite failed more, and he was much emaciated. He was more restless at night, now singing, then crying out with pain, and had occasional slight convulsive movements of the limbs. At this time, the tumor of the orbit formed a rounded projection some 2″ in diameter, its summit projecting $1\frac{1}{4}$″ beyond the brow, over which the lids were stretched and elongated, their free edges $\frac{1}{2}$″ longer than natural, and separated some $\frac{3}{4}$″ in the centre; the space between them closed by a dark-red granulating surface, from which there was very little secretion. The enlarged gland over the ramus of the left jaw had attained the size of a filbert, and there was another swelling over the coronal suture on the right side, rather nearer the zygoma than the vertex, $\frac{3}{4}$″ in diameter and $\frac{1}{3}$″ high. The right pupil had within two or three days returned to the normal size, and now reacted well to light, and the boy said he could see again; but on testing him with a lamp, there was apparently no perception of light.

The next few days he gradually failed, and died on the morning of October 12th. No autopsy could be obtained.

The tumor was placed for some three weeks in Müller's fluid, and afterward in dilute alcohol. A horizontal section was made through the wound in the cornea and passing through the optic nerve. The globe was nearly of normal size, very little flattened from before backward, but at the same time presenting some projection of the most anterior portion. It was completely filled by a dense, faintly yellowish-gray mass, varying in shade in different parts, through which ran branching and anastomosing lines of dark brown, orange-yellow, and bluish gray, the latter resembling somewhat in color the cut surface of nerve-sheath and sclera; while in the posterior portion, to the temporal side of the insertion of the nerve and near the sclera, were several irregular, ill-defined, darkish-brown patches. The cornea was of nearly normal thickness. The sclera was everywhere thinned, but this was especially the case around the entrance of the nerve, where it

was pushed backward so as to form a sort of irregular staphyloma, in the midst of which the nerve projected somewhat into the cavity of the globe. Here the scleral tissue was extremely thin, and appeared frayed on the outer surface, sending short outshoots into the mass of the extra-bulbar growth. Except in the posterior portion of the globe, a narrow, irregular, light-brownish line separated the sclera from the mass within, and from this, brownish lines extended here and there into the mass to join the other lines running through it. The portion of nerve removed was 8‴ in length. The outer nerve-sheath was thinned, the nerve itself a little larger than normal; nerve and sheath were closely united, and no trace of the interval between inner and outer sheath to be seen. The space within the sheath, through the whole length, was filled with a dense mass, resembling in color and appearance that filling the bulb. Nearly everywhere a brown streak, of varying width, ran along the inner surface of the sheath, and a few brown dots or faint short streaks appeared in the midst of the mass which filled it. To the temporal side of the nerve, about 1‴ removed from its outer edge, was a bluntly conical mass, resembling that filling the bulb and nerve-sheath, running outward and backward, its base 3‴ in width, its height about $3\frac{1}{2}$.‴ The base of this mass rested against and was united with the thinned sclera, its sides appeared bounded by a thin layer of fibrous tissue; at its edges and within its substance were irregular, ill-defined brown spots.

The remaining extra-bulbar portion of the tumor presented a sharply defined contrast to that which has been described. It inclosed the posterior third of the globe and the conical mass mentioned; its greatest width was nearly on a level with the insertion of the nerve in the sclera, where it was 2‴ or 3‴ wider than the globe at the equator, and it extended backward nearly to the divided end of the nerve. Its cut surface was generally of a faint greenish-gray color, variegated by curving streaks of a yellowish gray and faint lines of fibrous tissue, which gave it a somewhat lobulated appearance. The boundary between it and the fatty tissue surrounding it was irregular; in some parts pretty distinctly defined, in others not; and here and there short, pointed outshoots into the fatty

tissue appeared. Outwardly and anteriorly, a portion of the external rectus muscle lay along its edge, separated from it by a layer of fibrous tissue. The portion of this muscle which had been removed was divided longitudinally by the section made, and showed to the naked eye nothing abnormal.

Microscopic examination of the extra-ocular tumor showed that it was mainly made up of a closely aggregated mass of small cells, not much larger than white blood-corpuscles, with little intercellular substance. The cells were generally round, often with slightly irregular contour, occasionally with one or two short fibres projecting from the periphery, while some had the form of short spindles. In most of them, a faintly granular round nucleus appeared, nearly filling the cell, and surrounded only by a narrow zone of pale protoplasm; in others, no protoplasm surrounding the nucleus could be made out. Some of the spindle-cells were pointed only at one end, the other rounded and entirely filled by the nucleus; others pointed at both ends with the nucleus in the centre filling the whole breadth; in these cells, the protoplasm of the extremities was pale and faintly granular. The intercellular substance was finely granular, often having the appearance of a pale network of granular fibres, and easily broken.

Numerous capillary vessels, and many of much larger size with thick adventitia, and scattered curving bands of pale fibrous tissue, more or less infiltrated with small cells, ran through the growth. Small portions of the tissue in the more yellowish-colored streaks were degenerated, showing shrunken cells, free nuclei, granular matter, and diffused hemorrhages. Toward the borders of the growth, traces of fatty tissue could be seen, the fat-cells surrounded, separated, and compressed by the small cells of the tumor, and, proceeding farther outward, the gradual infiltration of small cells between the fat-cells could be clearly followed.

The fibres of the external rectus muscle seemed unchanged; the transverse striation and the nuclei of the sheaths were plainly visible. Between the bundles of fibres, however, the growth had penetrated, presenting in the sections small round or oval groups of cells, or narrow bands two or three cells in width, surrounded by connective tissue, and recalling strongly

some of the appearances seen in the small cell variety of epithelioma. The individual fibres of the bundles were, for the most part at least, not separated by the disease, but scattered cells appeared here and there between them.

Sections of the optic nerve showed, under a low power, traces of the normal arrangement of the connective tissue bands surrounding the nerve-bundles. Higher powers showed that this tissue was pale, degenerated, infiltrated with granular matter and *débris* of small cells, but still contained traces of blood-vessels. The spaces between these bands, normally occupied by the nerve-fibres, presented little but granular matter and *débris* of cells and fibres. The central vessels of the nerve could generally be traced, though their walls were everywhere much degenerated: portions of them contained blood-corpuscles, and often were surrounded by hemorrhages; others contained a partly granular, partly amorphous mass, and still others were filled with a homogeneous substance, strongly refracting light and readily absorbing coloring matter. Neither the inner sheath of the nerve nor the characteristic tissue in the space between the sheaths could be anywhere made out. The brownish line which macroscopically lined the inner surface of the outer sheath was made up of irregularly dilated blood-vessels and hemorrhages, with here and there a few scattered dots or clumps of orange-yellow hæmatine. The inner layers of the outer sheath were separated from each other by rows and groups of small cells, and a few well-formed cells were scattered in the hemorrhagic district and edges of the nerve. The outermost layers of the sheath were pushed apart by the growth external to it in the same way; its central portion was little changed, but here and there a few small rounded or spindle-shaped cells were evident, and along some of its blood-vessels similar cells were found in rows. Beside these cells, resembling in every respect those of the tumor, other cells lay here and there in the tissue of the sheath or along the side of the separated fibres. These latter were three or four times as long as the glioma cells, narrow and pointed, and contained a pale, elongated oval nucleus, in which one, two, or more nucleoli could be seen.

The intra-ocular mass and that forming the conical projec-

tion outward and backward were made up mainly of granular matter, and more or less degenerated small cells. The conical projection showed a pretty uniform degree of degeneration throughout, though much less in amount than existed in many parts within the globe. It contained some hemorrhages, but consisted mostly of irregular masses of partially shrunken cells grouped about small blood-vessels, interspersed in nearly equal amount with districts of granular *débris*.

Through the intra-ocular mass irregular bands of pale fibrous tissue passed. Some of these bands ran forward from the entrance of the nerve, and probably were formed of the altered connective tissue of the separated retina and the vessels which had supplied the growth; others, more anteriorly situated, may have arisen from alteration and displacement of the iris and ciliary body, or from fibrous changes of the vitreous. Blood-vessels, some still containing well-formed corpuscles, were frequently seen. The amount of the degeneration varied very considerably in different parts. Toward the inner (nasal) side of the globe, numerous groups of tolerably well-formed cells, mingled with some *débris*, were clustered around a central vessel, and entirely surrounded by greatly altered elements. Many parts contained fat-granules; and in the most degenerated district, rather anterior to the centre of the globe, were very numerous fat-globules of large size. The colored portions were made up of hemorrhages and dots and clumps of orange-yellow hæmatine, and, in the more anterior parts, of granules and masses of dark-brown pigment, a portion of the latter contained in round or oval cells two or three times the diameter of the cells of the growth. The brown pigment and most of the yellow was situated in the fibrous-tissue bands, as were also many of the blood-vessels. Anterior to the equator of the globe, quite near the sclera, and especially at the inner (nasal) side, where the degeneration was less complete, a number of round or oval cells, two or three times the diameter of the glioma-cells, and containing fat-granules and a nearly circular nucleus, were found. Besides these, there were a few large, pale cells, with generally one or two, rarely three long processes, the nucleus large and elongated, strongly resembling the branching cells of the choroid. Both these varieties of

cells must without doubt be regarded as remaining choroidal cells; the large proportion of round and oval cells and the want of pigment in them is readily explained by the early age of the patient, since at birth the choroid proper contains no pigment and no branching cells. The dark-brown pigment referred to above was probably derived from the uvea.

The innermost layers of the sclera were everywhere pushed apart by an infiltration of small cells, and in many places rows of cells were found in most of the spaces between the layers through its whole thickness; in the ciliary region, the cell-growth surrounded the perforating vessels, and occasionally in great part displaced the scleral tissue. The layers of the cornea were more fibrillar and less transparent than normal, interlaced more, and often ran at a considerable angle with its surface. They were nearly everywhere separated by rows and groups of small cells, and in some parts red blood-corpuscles were scattered in the interstices of the posterior layers. The more peripheral parts of the cornea contained many blood-vessels, often of large calibre, and situated at various depths below its surface. In the cornea, as also in the sclera, were here and there isolated, elongated, pointed cells, with long nucleus and one to three or four nucleoli, like those described in the nerve-sheath; the normal scleral and corneal corpuscles. The membrane of Descemet was almost universally detached from the cornea, and lay in wavy folds, the space between it and the cornea filled with a growth of often perfectly formed cells, while on the posterior side of it the cells were much degenerated. The corneal epithelium was wanting except toward the sclero-corneal border; there it was generally thicker than the normal; most of the cells appeared spinous. No trace of the lens was seen.

There are some features of the case just reported which are of sufficient interest to call for special remark. A consideration of the clinical history and the condition of the contents of the globe revealed by microscopic examination, in connection with the facts already known as to the development and course of intra-ocular glioma, can scarcely leave a doubt that the inflammation which occurred when the child was fourteen months old was excited by a previously existing intra-ocular

tumor, and that the growth did not arise secondarily after the eye had been lost. It has indeed been shown in rare instances, (Graefe,[1] Lawson,[2]) that a sarcomatous tumor has originated in an eye after it has been lost by injury, and certainly the possibility of origin of either glioma or sarcoma in an eye the seat of former destructive disease must be granted. No authentic case of the sort has, however, thus far been observed. On the other hand, it is not very infrequent that an intra-ocular tumor (either sarcoma or glioma) causes an inflammation of the globe which, with or without perforation of the cornea, is followed by a period of atrophy before the growth becomes extra-ocular. That perforation of the cornea had taken place in this case is probable from the absence of any trace of the lens. Knapp[3] has reported a case in which the sequence of inflammation, perforation, closure, and shrinking occurred a second time after an interval of three months, the glioma finally becoming extra-ocular some nine months after it was first observed. Hirschberg[4] quotes five cases (inclusive of Knapp's) in which temporary atrophy occurred; and v. Graefe[5] even described the symptoms which should distinguish an atrophy due to an intra-ocular tumor from one excited by other causes. Whether the symptoms which v. Graefe considered characteristic were present in the case under discussion, the history is not sufficiently complete to decide. The total disappearance of all elements of the normal intra ocular tissues, (if we except the few remaining cells of the choroid seen in the least degenerated part,) and the advanced degree of degeneration, shown by the abundance of hæmatine and large fat-globules, is evidence that the growth within the globe must have been of considerable age. Finally, the clinical history, while entirely compatible with the theory of previously existing tumor, offers no other explanation as to the cause of the original inflammation. The "speck on the sight," noticed by the mother when the child was six months old, I am inclined to regard as an opacity of the cornea due to ulceration, and as having no connection with the tumor.

[1] Archiv für Ophthalmologie, xiv. 2.
[2] Ophthal. Hosp. Reports, vii. 3.
[3] Die Intraoculären Geschwülste.
[4] Markschwamm der Netzhaut.
[5] Archiv für Ophthalmologie, xiv. 2.

The length of time the period of atrophy of the globe and latency of the disease continued is nearly double that in any hitherto published case. The longest period of atrophy I have been able to find recorded, viz., ten months, was in a case reported by Hayes and quoted by Wardrop;[1] there the cornea was not perforated. In the case above related, twenty months elapsed from the date of perforation before the eye began visibly to protrude. In this respect, then, the case may be considered not without importance as a contribution to the literature of intra-ocular glioma.

Another point of interest concerns the conical mass attached to the posterior part of the globe. It seemed at first, from the position of this mass, its sharply defined outline, and the marked degree of degeneration which existed throughout it, as if the growth of the tumor had ceased for a while after it had passed through the sclera and invaded the orbital tissues. That the growth should temporarily cease after involving so vascular a tissue as is there present, was certainly remarkable. Examination showed, however, that the sides of the cone were entirely surrounded and inclosed by a dense layer of fibrous tissue, and that this layer was in intimate union with the sclera at the base of the cone. From the base of the cone forward, for a distance of 1‴ to 3‴, Tenon's capsule was also found intimately united with the sclera. It is probable, therefore, that here a development of the glioma had occurred between the sclera and Tenon's capsule; that firm, inflammatory adhesions between capsule and sclera had prevented its spreading laterally, and it had enlarged in a backward direction, bulging the capsule before it. The resistance offered to its progress by the firm capsule served to render its increase slow, and gave time for the degeneration to take place.

There is one other peculiarity of the case worthy of note: the behavior of the iris of the right eye. About three weeks after removal of the left eye, the pupil of the right became large, as in paralysis of the sphincter, and remained in this condition for some five weeks, responding scarcely or not at all to light, vision being at the same time wanting. The movements of extra-ocular muscles supplied by the third pair were

[1] Fungus Hæmatodes, p. 55.

apparently unaffected. Then, while the boy's general condition grew worse, and vision did not return, the pupil for some days before his death returned to its normal size and reacted to the stimulus of light. Progression of the disease along the left optic nerve to the chiasma readily explains the loss of sight; but the return of reflex action in the iris after it had been so long wanting, and while the disease must have been continually progressing, seems wholly inexplicable. Possibly an autopsy might have thrown some light on the mechanism of this phenomenon.

WHITE SARCOMATOUS INTRA-OCULAR TUMOR. ENUCLEATION. By B. Joy Jeffries, M.D., Boston, Mass.

February 5th, 1873, a woman, aged 40, applied to me, having V.O.D.=$\frac{20}{30}$, V.O.S. Jäger No. 16, with some portions of the field. At twenty feet can see my arm or hand moving over some parts of the retina. The visual field was taken on the register. Ophthalmoscopic examination shows a pinkish nerve and clear media. From close against the nerve, up and in, is a growth pushing forward, the retinal vessels running smoothly over it. The end against the nerve is oval. The whole, as seen, seems the size of a small almond. It has a whitish-gray color. Only within a week, the patient says she has noticed her *present* loss of sight; but, upon close questioning, her vision in this left eye has failed for some months back. There is no pain in the eye, but, as she expresses it, a sensation of "heaviness" and "fatigue." The patient did not exhibit any other sign of morbid growth. The tumor was decided to be most probably sarcoma, and an enucleation strongly advised. This was finally consented to and done under ether, February 19th, 1873. To satisfy the friends of the existence of a tumor, the globe was necessarily opened at once. The vitreous was of normal consistency, but had a yellowish tinge. The retina became readily detached from over the tumor, with retinal pigment adhering to it. The tumor was of the size above mentioned. The specimen was put in Müller's fluid till March 13th, 1873, when it was again carefully examined, and all the internal structures found good. The growth was not wholly attached to the sclerotic. The line of demarkation was also perfectly distinct. It belonged to and occupied

the place of the choroid, reaching as far as this encircles the optic-nerve entrance. The nerve, on section, seemed healthy. The tumor may have *pressed* the nerve, but it did not involve it. The tumor was something over half an inch in length, reaching farther forward than the ophthalmoscope showed. Its thickness was about one third of its length. Section of the tumor showed it to be non-vascular, yellowish white, homogeneous, pretty firm, distinct from the sclerotic, occupying the space and place of the choroid, up to but not involving the nerve. A layer of retina with pigment, or a layer of choroidal pigment, peeled off the surface of the tumor. Under the microscope it was found to be spindle-cell, and round, and ovoid white sarcoma. The cells as broad and three times the length of a blood-corpuscle. There was no pigment. For quite similar case, *vide* Knapp, "Intra-ocular Tumors," Tab. XIII., Fig. 58.

INTRA-OCULAR TUMOR. WHITE FUSIFORMED-CELL SARCOMA. ENUCLEATION.

By B. Joy Jeffries, M.D., Boston, Mass.

A man, aged 60, came to me April 1st, 1873, complaining of pain over left side of head and in the left eye. Vision was reduced to the perception of light eccentrically. The pupil was dilated with atropine, and with the ophthalmoscope the fundus was blurry, the nerve dimly seen. A tumor was noticed on the inner side, in the ciliary region, just reaching into the dilated pupil. It reached backward beyond the middle of the globe, and the retinal vessels were seen running over it. It was thought to be sarcomatous, and enucleation advised and performed under ether, April 3d, 1873. The globe was at once opened and the tumor found as above. The preparation placed in Müller's fluid.

The man looked in fair health and had been a hard worker. He however complained of some head symptoms, such as "uneasiness" in head and ear. This last Dr. H. L. Shaw examined and reported "slight chronic difficulty." These very slight cerebral symptoms were not thought to militate against good hopes from immediate enucleation. April 11th, 1873, the patient for the first time complained of some pain just in front of left ear, or rather tenderness on pressure. A small gland here was slightly swollen. The lids had puffed more than usual after enucleation, giving a thought of impending erysipelas. All these symptoms, however, passed off within a few days.

June 24th, 1873, the specimen was taken from the preserving fluid, and a section made through the centre of the tumor horizontally, and through iris, lens, and cornea, all in natural

position. The substance of the tumor was firm, homogeneous, whitish, and no pigment was seen. It was attached to the sclerotic, about the size of a small filbert, reaching forward to the insertion of the iris, and backward beyond the median line. It touched the back of the lens, pressing forward the ciliary muscle and processes. The sclerotic lying against it was perfect. It occupied the place of the choroid, pushing the retina inward on its surface. The rest of the globe and optic nerve seemed perfectly normal. The microscope showed it to be a fusiformed-cell white sarcoma, such as Knapp gives in Tab. XII., Figs. 50–53, in his monograph on intra-ocular tumors.

CANCEROUS ULCERATION OF THE SURFACE OF THE GLOBE. By Dr. Henry D. Noyes, New-York.

Miss A. B., æt. 16, living in Western Massachusetts, was brought to me by her family physician, Dr. Collins, in April, 1872. She was of delicate appearance, thin, complexion pale and sallow, strength feeble, appetite poor, no cough, and had been losing health for many months.

About fifteen months ago, a small red spot appeared on the right eyeball, just below the cornea. It was painless and was not attended with secretion or photophobia. It resisted simple measures of treatment, and by and by developed into a "pimple." Three times this elevated tissue has "broken" and given vent to discharge, but never has it caused pain or general inflammation of the eye. The patient lived several miles from a physician and seldom called for his services. No important treatment has ever been adopted.

The appearances which I find are as follows: When the lids are separated by the fingers and the globe directed upward and outward, an irregular and deep ulcer occupies the inner and lower part of the sclera and cornea, nearly to its middle. Its outline is ellipsoidal. Its extreme horizontal length is about one inch, and its vertical breadth about half an inch. Its edges are elevated and somewhat papilliform. A thin fluid oozes from it. The surface consists of bosselated, warty masses, with intersecting fissures and depressions, the little masses being in their greatest development as large as hemp-seeds, the smallest of inappreciable size. The color and texture of these masses is peculiar. Unlike ordinary granulations, they are gray and translucent, mingled with a pinkish tint. They have

the look of grains of boiled tapioca scattered over a reddish ground and separated from each other by deep clefts. There has been no tendency to hemorrhage from the sore. It gives little or no pain. The ulcerating surface does not lie below, but considerably above, the level of the surrounding tissues, and this is especially marked at the edges. The encroachment upon the cornea reaches to the border of the pupil, while a margin of opacity extends about a line farther. The tension of the globe is —1.

There is considerable hyperæmia in the neighborhood of the sore, but this does not extend over the rest of the globe in a decided degree.

The lower part of the ocular conjunctiva is thickened as in papillary trachoma, but the palpebral conjunctiva presents no hypertrophy. Below the ulcer, nearly at the level of the *cul de sac*, is a deep furrow, and then a ridge of neoplastic tissue similar to that of the principal mass. The surface of the growth may be touched with impunity.

Vision is ^{20}. The interior of the eye can be seen with the ophthalmoscope, and no signs of any new growth can be discovered. Even when the eye is turned far downward, the interior looks normal. The nerve is congested, its vessels rather full, both arteries and veins; lens and vitreous clear. The pre-auricular lymphatic gland is not enlarged, but a much enlarged gland is found under and in front of the angle of the jaw. It is as large as a hickory-nut. It has been in this condition for weeks, and has been larger and painful.

There has been a decided depreciation of health within a few weeks. She has lost flesh, had diarrhœa and pain in the stomach, and a little cough. Now she feels weak and has a poor appetite.

The diagnosis was a cancerous ulceration of the surface of the globe. Its precise nature was not determined by microscopic examination. Nothing but extirpation could be suggested, and this the parents and the patient were unwilling to have done. My knowledge of the subsequent history of the case is gained from Dr. Collins, who wrote to me that the patient lived about three months longer. He says that the appearance of the eye did not change much, but the tumor under

the jaw continued to enlarge. She died by exhaustion, in the country. No autopsy was made.

Cases like the above are rare, especially that they should arrive at so late a period of development before coming under the eyes of an ophthalmic surgeon. Two cases are recorded by Graefe, in the Archives, of cancroid tumors removed from the surface of the globe, and with no relapse. Wecker[1] quotes these cases, and devotes a chapter to the description of cancerous ulceration. His account resembles pretty closely the clinical features of the above case.

[1] I find a note in Deval, (Paris, 1862,) page 803, which describes in brief a case which seems essentially the same with the above. Sichel, Iconographie, page 598.

DEMONSTRATION OF PATHOLOGICAL SPECIMENS. By H. Knapp, of New-York.

I. *Intra-ocular Enchondroma.*—This specimen has been described in the *Archives of Ophthalmology and Otology*, (III. 1.) As it is the only one of its kind on record, I thought the members of this society might examine it with interest. I shall not enter into a description of it, but confine myself to the remark that I owe the specimen to the kindness of Dr. J. J. Chisolm, of Baltimore, who extirpated the growth after it had existed twenty-two years. The patient died from after-bleeding; for the arrest of which the doctor unsuccessfully ligated the common carotid artery. The growth is made up of hyaline and fibrous cartilage accumulated in nodes, and of connective tissue which, in most places, shows its conversion into cartilage.

II. *Tumor of the Iris.*—Two years ago, I visited Dr. Argyll Roberston's ophthalmic clinic in Edinburgh. A girl of about 18 years of age presented herself with a grayish tumor on the iris the size of a pea. Her sight had been failing for a year. There was distinct cupping of the optic nerve. Dr. R. extirpated the eye, and was kind enough to give it me for examination, with a complete history of the case. As the microscopic appearance of the eye is not without interest, and tumors of the iris are rare, I brought this specimen here for demonstration, before the microscopic examination destroys it.

III. *Choroidal Sarcoma. Infection of the Retina. Dissemination from the Retina to Parts of healthy Choroid.*—I am indebted for this specimen to Dr. E. Williams, of Cincinnati. A sarcomatous growth in the posterior region of the choroid produced episcleral and orbital tumors, and the patient died a few months after the removal of the eye, from meta-

static sarcomata in the inner organs of the body. The remarkable features of the specimen, which I examined carefully, are: the retina lies like an irregular cord, with an uneven, nodular surface, in the centre of the eye. It is completely metamorphosed into round-celled and spindle-celled sarcoma substance. Between it and the choroid there was fluid. On the otherwise healthy choroid a great number of isolated white nodules were seen, more densely strewn on one half of its area than on the other half. They were small sarcomata situated between the pigment epithelium and the hyaline membrane of the choroid. Microscopic clusters of a few cells were also seen upon the epithelium. The larger nodules raised and perforated the epithelial layer. The mode of propagation of the pseudoplasm exemplified by this specimen is highly important. The original choroidal tumor touched and surrounded the optic nerve, its elementary parts invaded the retina, which became detached, and fluid collected between it and the choroid. The disorganized retina ulcerated, and detached particles of the pseudoplasm fell through the subretinal fluid upon the healthy parts of the choroid. Here they took root, pierced the epithelium, were arrested by the hyaline membrane, but were in favorable nutritive conditions on account of the proximity of the chorio-capillaris. The retina in this case was infected by contact, but afterward acted as a seminium strewing the morbid seeds back on healthy portions of the choroid.

IV. *Intra-ocular Hemorrhage. Formation of Amyloid Bodies in the Vitreous. Amyloid Degeneration of the Choroidal Arteries.*—This specimen is taken from a man, 42 years of age, who came to me about six months ago stating that three days previously he had noticed that his left eye had become blind. He experienced only slight pain and some heaviness in the eye. I found very little subconjunctival injection, the pupil somewhat dull, and the fundus completely dark. Perception of light was faint. My diagnosis was: hemorrhage into the vitreous space. Leeches, decubitus, and darkening of room ordered. The upper portion of the fundus, in the course of a week, yielded a faint red reflex, and with oblique light I could see blood at the bottom of the eye. Perception of light very faint and only in lower parts of the field of vision. In

the course of two weeks, the red reflex in the upper part of the eye and the blood in the lower could no longer be seen. The whole vitreous space seemed to be filled with a semi-transparent, finely granular, dark gray-brown substance, in which no details were distinguishable. The eyeball was white and of normal tension. As the case did not assume the course of an idiopathic hemorrhage, I thought that a choroidal melanotic tumor was concealed by the hemorrhage, and was also its cause. Not being able, however, to detect any symptoms of a tumor, I told the patient my opinion, with my doubts, and advised him to have his eye examined by some other eye-surgeons. He consulted Dr. Noyes and Dr. Althof; both declared the difficulty a melanotic tumor, and urged enucleation of the globe. I did this the day after, and opened the eyeball immediately by a meridional section. The vitreous space was completely filled by a very soft, black substance such as I had never seen before. My first impression was, that I had an exceedingly soft melanotic sarcoma before me; but the microscopic examination discovered an entirely different condition: the black substance consisted exclusively of blood-corpuscles and semi-transparent, glassy-looking, homogeneous globules, which in quantity prevailed over the blood-cells. They were not changed by alcohol, ether, and acetic acid, but assumed a beautiful red-brown mahogany color by the addition of tincture of iodine. Sulphuric acid rendered them dark blue. Their amyloid nature being manifest, I examined the membranes of the eye, found them all in their proper position and normal, except the choroid, in which the inner and middle coats of the arteries had undergone extensive amyloid degeneration. Not long ago, that is, seven months after the removal of the eye, I examined the patient's general system, but found no indication of amyloid disease anywhere. His complexion is pale, but he is vigorous and never had a constitutional taint. Amyloid disease, up to this hour, has only been diagnosticated on the post-mortem table. Is it reserved to the ophthalmoscopist first to detect it in the living body? The symptoms of the preceding case appeared to me marked enough to diagnosticate this disease, if I should chance to meet with other cases.

SCLEROTITIS DEPENDING ON GOUTY OR RHEUMATIC DIATHESIS. By Henry D. Noyes, M.D., New-York.

My attention was called last winter to some severe cases of acute scleritis occurring in persons suffering from gouty or rheumatic disease, who had entered Bellevue Hospital on account of ill-health, which was the result of their constitutional dyscrasia. I saw three such subjects, and all of them had, besides other symptoms, evidences of gouty kidney, and I was at first led to associate the acute ocular inflammation with the kidney lesion. But I am more inclined to regard both as manifestations of the general disease.

In one case, which was the most important, the existence of gout was completely concealed during life by other complicating conditions, and was elicited only by the post-mortem examination. In this and in one other case, an iridectomy became necessary to relieve the violent inflammatory action. In another case, an iridectomy was intended, inasmuch as relief was not obtained by medicinal agents, but was not done because the patient feared to have it performed; and then by a change of medication a prompt and complete recovery was brought about.

Other cases show that, while a remedy may act efficiently in some instances, a totally different one must be chosen to do the work in other cases. I am not yet prepared to show what are the indications for the choice of one remedy above another.

Mr. Hutchinson has written an elaborate article in recent numbers of the Ophthalmic Hospital Reports, giving his observations of the influence of gout in causing various kinds of ocular inflammation, namely, of the cornea, iris, sclera, etc.

What I have to relate is a different aspect of the same subject, and corroborates the stress he attaches to an inquiry into this condition. He properly intimates that syphilis has acquired an almost exclusive place in the etiology of the day, and we need to be reminded that other poisons are equally capable of producing severe ocular inflammations.

For the careful and complete notes of the first case I am indebted to the resident physician of Bellevue Hospital, Dr. M. B. Early, who also made the autopsy; and for the microscopic examination of the globes I am under renewed obligation to Dr. Francis Delafield.

The case may have the following title.

No. 1.—Gouty inflammation of the tissues of the orbits and eyeballs requiring iridectomy—relief by the operations—subsequent death, and autopsy.

John Van Stan, 48, M., Ireland, painter, admitted October 26th, 1872. Patient's father and mother are living and healthy. His mother suffers from rheumatism. Several brothers and sisters living and healthy. One brother was killed in a fall. Had gonorrhœa; had a chancroid followed by a suppurating bubo. Patient had lead-colic about twenty years ago; has had several attacks since. In 1863, he had acute articular rheumatism. When in the army, he was a great deal exposed, and suffered from "cold," cough, expectoration of a yellowish matter, sometimes spitting up blood, shortness of breath, palpitation of heart. Since that time he has had occasional attacks of rheumatism. Patient is intemperate. In June last, he had an attack of lead-colic, from which he has been suffering up to the present time. On last Wednesday, he took some anti-bilious pills. He states they were followed by evacuations of blood and matter.

On admission, patient gives the above history, and complains of pain in abdomen, shoulders, arms, knee, and joints of right index-finger and left great toe, the two latter-named points being red, hot, swollen, and painful.

Physical examination: lungs, emphysematous; heart, hypertrophied.

October 30th.—Patient complains of some itching in outer canthus of left eye; some pain and soreness.

October 31*st*, A.M.—Eye is considerably swollen, considerable chemosis; complains of considerable pain; sight is very dim. Patient is able to distinguish the figure, but not the features, or colors; complains of photophobia.

November 1*st*.—Same symptoms as above, but in a more aggravated form; eyeball prominent, cornea clear. Conjunctivæ are pale; discharge thin. Ordered, ℞. Argenti nitratis, gr. v.; Aquæ, ℥ j. The above to be applied by means of a camel's-hair pencil. Ordered also cold applications, iron and quinine.

November 2*d*.—Eye looks better, apparently granular; complains of some pain. He complains this A.M. of some pain in right eye, which is considerably congested. Ordered cold applications. P.M., the left eye looks better, some pain; complains of pain and soreness in the right eye. There is considerable chemosis and congestion of the conjunctivæ. The pain is mostly at the outer part of the upper lids, and in the forehead just above and between the brows. The cornea of the right eye is clear.

November 3*d*, P.M.—Pulse, 90; Resp., 21; Temp., 100¾°. Both eyes are still pressed forward. The right eye is more so than the left. The conjunctiva of right eye swollen to edge of the cornea. The conjunctiva pressed out in a ridge over the lower lid, and covered with a whitish membrane. The discharge from the eye is mucous or slightly purulent. There is very little motion to the eyes. Patient can not look up or down. The eyes seem nearly fixed.

November 4*th*, A.M.—Pulse, 112; Resp., 24; Temp., 102°. Patient's condition unimproved. Complains of pain in the same location as before. P.M., pulse, 135; Resp., 24; Temp., 101¼°. 3.30 P.M., 10 leeches were applied to the temple. Prof. Noyes examined the eye with an ophthalmoscope.

Examination: left eye, cornea is clear; anterior chamber normal; crystalline lens not pushed forward, but has an opacity in its centre in front. The vitreous humor somewhat hazy, but permits an indistinct view of the optic nerve. Patient can distinguish the hand and count the fingers with this eye at the distance of a foot, but can not distinguish the features. The eyeball has but little motion. The swelling of the conjunctivæ is mostly around the equator of the globe and is very

hard, forming a distinct ridge when pressed back from the cornea by the handle of a scalpel. There is considerable tension of the globe.

Right eye, there is marked tension of this eye. The conjunctiva is very much swollen, the eye speculum could not be introduced to hold open the lids. The conjunctiva forms a ridge extending over the lower lid, and has a yellowish membrane over this ridge. The chemosis is very great around the equator of the globe. The cornea is slightly hazy. The anterior chamber is normal. The crystalline lens is not pushed forward and is very clear. The vitreous humor is very opaque and does not permit a view of the optic nerve. Has no sight at all in this eye. There is the appearance of suppuration going on. 4.30 P.M., Prof. Noyes performed iridectomy upward in both eyes and applied a bandage. 8 P.M., ordered Sol. morph. U. S., ʒ ij. 10.15 P.M., was called to stop bleeding from leech-bites. Found considerable arterial flow; applied solid stick of nitrate of silver, which soon checked the hemorrhage; applied compress and bandage. Patient lost two or three ounces of blood, felt comfortable. Ordered Quin. sulph., gr. x. q. 4 h.

November 5th, A.M.—Pulse, 156; Resp., 31; Temp., 102°. Slept very well; no pain during the night. Complains of no pain this morning in his eyes. Complains of some pain in his abdomen. Skin is warm and dry.

Ordered whisky ℥ ss. q. 2 h.

12.30 P.M.—Pulse, 152; Resp., 30. Patient is sleeping quietly. 2 P.M., feels comfortable. Complains of no pain. Pulse, 134; R., 36.

Prof. Noyes came at 3 P.M. He removed the dressings from the eyes. There is much greater freedom of motion in both eyes. The conjunctivæ are more congested, and the chemosis is more marked around the orbit. There is more chemosis and prominence of the right eye than the left. There is great improvement of the right eye as regards the suppurating appearances. The condition of both eyes improved above that of yesterday; can see the hand and count the fingers at distance of one foot. Can not see at all with the right eye. 5 P.M., patient feels easy; no pain; tongue coated and moist; eyes

are not painful, but feel sore; bowels moved this A.M. Skin warm and dry.

Ordered egg-nog. Pulse, 138; Resp., 30. 6.30 P.M., breath and skin smell rather sweet and strong; this has been the case for several days. Pulse, 130; Resp., 30; Temp., 99⅝°.

November 6th, 8 A.M.—Slept quite well; had a sharp pain in the right eye whenever he moved about in bed. No pain at other times in this eye. No pain at all in left eye or anywhere else. Pulse, 117; Resp., 22; Temp., 98¾°. Eyes not so much swollen. Right cornea hazy and wound not healed; left eye, cornea clear and wound healed. Can see imperfectly with both eyes, less perfect with right; chemosis not so great; eyes sore; but no pain. General condition somewhat better; skin is moderately warm. 5 P.M., Pulse, 122; Resp., 24; Temp., 99⅝°. Patient states he feels first-rate; skin is moderately warm. Had two passages from bowels to-day. No pain, feels weak. Tongue is slightly coated and dry, is very thirsty. Has some cough, but very little expectoration.

November 7th.—As the patient sleeps, there is considerable subsultus tendinum, which has been noticed at times for several days. Pulse, 110; Resp., 26; Tem., 99½°. Sight in left eye very much improved. States he can detect shadow with his right eye; both eyes much improved. General condition very much improved. 3 P.M., left eye counts fingers at eight feet; œdema almost gone; tension normal; exophthalmus disappeared.

Right eye, œdema of lid and exophthalmus have disappeared. Eye little injected; tension normal; discerns light. Is disposed to sleep and is stupid. 5 P.M., patient says he feels a great deal better; has no pain anywhere. Skin is warm and moist; tongue is clean and dry. Pulse, 100; Resp., 22; Temp. 98½°.

November 8th, 9.30 A.M.—Patient feels comfortable; has no pain. Eyes look much better. Sight of left eye greatly improved. Can count fingers with right eye at distance of two feet. Has a tendency to sleep all the time; says he feels stupid.

Treatment continued. Ordered whisky ℥ vj. in 24 hours. Pulse, 112; Resp., 33; Temp., 99⅛°. P.M., P., 119; R., 33;

T., 99¾°. 9 A.M., Pulse, 118; Resp., 33; Temp. 99⅛°. Patient feels somewhat better. Can see very well with left eye. Sight of right eye is improving; conjunctiva very much congested. Patient is still stupid and says he feels sleepy all the time. P.M., Pulse, 114; Resp., 32; Temp., 98°. Patient states he feels first-rate.

November 10*th*, A.M.—Patient says he feels very well. Orderly states that the patient was delirious during latter part of the night; was up and walking about the ward and talking incoherently. He was perfectly rational this A.M. Had a good appetite for breakfast this morning. Had a passage from bowels. Pulse, 121; Resp., 35; Temp., 98⅝°. P.M., states he does not feel so well. Complains of shortness of breath, some cough. No pain. Examination of lungs reveals a few moist râles over lower portion of left lung. Had two passages from bowels to-day, passes water freely. Tongue is clean and moist; skin is warm and moist. P.M., Pulse, 124; Resp., 38; Temp., 99½°.

November 11*th*, A.M.—Pulse, 120; Resp., 34; Temp., 98¾°. Patient is very stupid; has aphonia this A.M. Complains of shortness of breath last night and this A.M. Complains of weakness, and says he feels stupid. No pain anywhere. Throat feels dry. No swelling or tenderness in throat. Tongue is dry and coated brown. Appetite good. Eyes are still somewhat congested. Sight is still improving.

November 11*th*, P.M.—Pulse, 128; Resp., 32; Temp., 100¼°. Patient states he feels comfortable. Has no pain, has some cough. Expectoration abundant and muco-purulent. Has an offensive odor. Some dyspnœa. Has had three passages from bowels to-day.

November 12*th*, A.M.—Pulse, 128; Resp., 33; Temp., 99. Says he feels better, was very quiet last night. Had four assages from bowels yesterday; but none since. They have an offensive odor. Skin is warm and dry. Tongue is brown, dry, and fissured. Has some cough and yellowish expectoration. Relapses into stupor immediately after being aroused. 5 P.M., Pulse, 124; Resp., 40; Temp., 102°. Patient is very weak; is still stupid. Has cough and some dyspnœa. Physical examination reveals moist râles over both lungs posteriorly.

Ordered,

℞. Ammoniæ muriat. . . . . ʒ ij.
Syr. prun. virg.,
Aquæ camphoræ. . . . . āā ℥ j.
M. et sig., 3 j. q. 4 h.

November 13th, 9 A.M.—Patient was quiet all night; died at 6.40 this A.M.

Autopsy, November 14th.—Exterior body moderately emaciated. Eyes and orbits, nothing to gross examination. Brain and membranes, increase of subarachnoid serum; normal quality. Slight opacity of the arachnoid. Some increase of ventricular serum. Brain-tissue normal.

Heart, left ventricle slightly hypertrophied; walls and membranes otherwise normal. Lungs, small cavity at the right apex. Considerable fibrous induration at the apex of the right lung, less in the left. Small nodules in the lung composed of firm gray and brownish elastic granules. The lower lobe of both lungs congested, but that of the right side more so. Œdematous, and air-cells contain some exudation.

Liver normal. Spleen a little enlarged. Kidneys small; capsule adherent; surface granular. Cortex, diminished size. Urates in the tubes of the pyramids and of cortex, knee, and metacarpo-phalangeal joint of great toe. Spinal cord, nothing except calcareous plates on the arachnoid.

Microscopical Examination of Eyes, by Dr. Delafield.—Both eyes have been removed with the muscles and surrounding tissues attached, and with nearly the entire length of the optic nerves. Both eyes present the same appearances. When they are opened, the vitreous is opaque. It contains fibrin and small round cells; at the fundus, a thin layer of fibrin and cells separates the *retina* from the *choroid*. The iris presents the coloboma of an iridectomy. The *lens* is in place. The *ciliary body* is swollen and filled with round cells. The choroid shows a remarkable distention of all its vessels with blood. The *retina* is altered by decomposition. The optic nerve is not cupped; it appears to be normal over its entire length. The *sclera* is thicker and denser than usual, especially at the fundus.

There seem to be, therefore, acute inflammatory changes, affecting the ciliary body, choroid, and vitreous in both eyes.

This history is furnished by M. B. Early, M.D., *House Physician.*

It had been my suspicion during the life of the patient and at the outset of the severe inflammation, that a pyæmic process was taking place in the orbits and indirectly affecting the eyes. The extreme prostration which occurred 48 hours after the iridectomies confirmed this opinion. The record of the pulse and temperature point to a very grave constitutional disturbance. From this, however, the patient rallied by the help of vigorous doses of quinine and whisky, and subsequently sank under influences which could not be accurately specified. In fact, the full diagnosis of the case was not made except upon the post-mortem table. While it was known that the man had had chronic rheumatism and what seemed to be lead-colic, (he was a painter,) the urine was not searched for urates, and gout was not thought of. When, however, uric-acid crystals were seen in the substance of the kidneys, and a deposit of urates found upon the cartilaginous surfaces of the joints of the knee and of the great toe, the true pathology of the case was made clear.

Two other cases in Bellevue Hospital I can only record from memory.

No. 2.—Gouty kidney, dropsy, cachexia; acute scleritis, iridectomy, relief; afterward relapse, and cure by iodide of potassium.

A man, æt. 60, of very intemperate habits, came into Bellevue Hospital in February, 1873, with dropsy and general cachexia, the result of his abuse of alcohol, and of gouty degeneration of his kidneys. His history clearly indicated that he had suffered from chronic gout, and the examination of the urine revealed that the kidneys had been invaded by this lesion. There was an œdematous condition of all the tissues, great anæmia, and his complexion sallow. There was a slight amount of heart-trouble. After he had been a short time in the hospital, he got inflammation of both eyes, which developed as a general scleritis of moderate severity. There was pain, general injection, moderate chemosis, a little lachrymal and no

catarrhal secretion; the aqueous became hazy, but the pupil not adherent. Leeches, cold water, and atropine were applied. After a few days, as the condition grew worse, iridectomy was done in both eyes. Relief ensued; but complete recovery was slow to take place. After three weeks, the injection of the eyes had not entirely disappeared, and then a subacute attack of the same kind of inflammation recurred. For this, iodide of potassium in doses of five grains three times daily was prescribed; and in four days the symptoms had yielded, while entire restoration was brought about in ten days. The man improved in health so as to be able to leave the hospital and return to work.

No. 3.—Another case in Bellevue was in a man æt. 30, likewise diagnosticated as having chronic gout with lesion of the kidney. In him a rather mild form of acute scleritis attacked both eyes, which yielded in a week to cold water, atropine, and Rochelle salt. No serious implication of the inner parts of the globe occurred.

A CASE OF WOUND OF THE SCLERA TREATED BY SUTURE, WITH REMARKS. By Thomas R. Pooley, M.D., of New-York.

It is one of the fundamental rules of surgery, in all cases of simple incised wounds, to bring the edges of the wound in contact after all bleeding has been arrested. It would seem strange, then, that this course of treatment has not been more adopted in the treatment of wounds of the eye. There are various means for bringing about this object, such as position, support by bandage or adhesive plaster, and the suture. The latter would seem at first sight to be most appropriate in wounds of the eyeball, and yet it is only lately that it has come into frequent use. This is no doubt due, in a measure, to the fact that such wounds of the eyeball are usually small and do not gape very wide, and again to the difficulty of their application and subsequent removal. In support of this latter fact, Mr. Thomas Windsor, in an interesting paper on "The Treatment of Wounds of the Eye by Suture," (Manchester Medical and Surgical Reports, October, 1871, pp. 1–8,) mentions the difficulties encountered in the introduction of sutures in the various trials at keratoplasty, and how often the attempt failed. An interesting review of these attempts at this impracticable operation may be found in his paper. It is not the purpose of this paper to say any thing about this subject, but to confine our remarks to the use of sutures in wounds of the sclera. It is well known that the possibility of introducing sutures even in the cornea has been demonstrated by Dr. Williams of Boston, who used them after cataract extraction. It is not necessary here to speak of his method, as

it is mentioned in his book, and again in the "Archives of Ophthalmology and Otology," (ii. p. 102.)

It was shortly after reading Mr. Windsor's paper, that the case I am about to report came under my care, and this method of treatment at once came into my mind. Before giving my own case, however, let me give in brief the recorded cases in which a wound of the sclera has been sutured. I should add that this task is rendered easy by making use of the references in Mr. Windsor's paper.

Von Walther just mentions the use of sutures in wounds of the eye, but, it appears, had never tried them himself.[1] The first case to which I refer was recorded by Dr. O. D. Pomeroy.[2]

"John S. N——, aged 21 years, a soda-water manufacturer, was struck on the eye by fragments of a soda-bottle which had burst, inflicting a wound of the sclerotic at the margin of the cornea, about four lines in length, causing a prolapsus of iris, (and perhaps of choroid,) an unsightly coloboma resulting. I easily succeeded in reducing the prolapsus, although it remained but momentarily. Two sutures were then passed through the conjunctiva, near the margin of the wound, and gradually tightened as the prolapsus was reduced: they failed, however, in reducing the whole, so a suture was placed between the two already in. The sclerotic aspect of the wound afforded a sufficiency of conjunctiva, but not so with the corneal; so the suture was passed through a portion of the sclerotic at its corneal junction, which closed the wound satisfactorily. The after-treatment consisted in the application of ice to the eye, atropine, and leeches.

"In fifty hours, the lateral sutures were removed, when the wound was found to be well adhered. On the next day, an effort was made to remove the central suture; but as the wound showed signs of gaping if much interfered with, it was not removed until the following day, when the wound was found to be well united. There was a little conjunctival injection,

[1] P. F. Von Walther, Augenkrankheiten, ii. p. 16. Freib. i. Br., 1849.

[2] Ophthalmic Review, vol. iii. p. 80, from the Boston Medical and Surgical Journal, vol. lxxiii. p. 216.

which disappeared in a few days. Patient sees as well, or nearly so, as with the other eye, which is normal."

Mr. Bowman twice resorted to this procedure.[1] In the first case, John M., aged 25, was admitted into the hospital October 31st, 1862, under Mr. Bowman, on account of an injury he had received the day previously. He was at work with an iron punch, when a piece flew off and struck the sclerotic on the inner side of the cornea close to its margin. There was a horizontal wound in the sclerotic at the inner margin of the cornea about $\frac{1}{6}''$ in length. The edges were not in apposition, and vitreous was oozing out. The anterior chamber was deep and the plane of the iris sloping backward. The aqueous was serous—T. 3, and daily diminishing. He could count fingers at from 6 to 7'. Mr. Bowman first made iridectomy at the inner side, and then adjusted the edges of the wound in the sclerotic by a fine suture, the needle being made to pass through each lip of the wound from within outward; using a fine silk thread with a needle attached at each end.

The second night after the operation, the man had a good deal of pain, which was relieved by leeches.

On November 4th, the iris had assumed its proper plane, the lens had come forward, and the tension of the globe was normal. The thread had come away. He could see letters of 16 Jaeger. The case did well, and when he left the hospital, (November 25th,) he could read letters of No. 10.

Mr. Lawson gives a short account of the second case, which is given exactly in his own words. "Mary S., aged 9 months, was brought to the hospital on July 7th, 1863, suffering from an injury to the left eye. A piece of china in falling off a shelf struck the eye, and inflicted a small wound in the sclerotic, close to the corneal margin. The wound (notwithstanding that a week had passed since the accident had occurred) was still a gaping one; the edges of it not being in apposition. Mr. Bowman applied a single suture, and with it brought the lips of the wound accurately together. No irritation followed; and on July 21st the child ceased its attendance at the hospital, the eye being quite well."

Mr. Lawson has also reported a case which was under his

[1] Injuries of the Eye Orbit and Eyelids. Lawson, London, 1867, p. 59.

own care.[1] The patient came under his care on March 5th, 1869. A few hours before, a fragment of stone flew up and struck him on the left eye. There was a jagged wound in the sclerotic, in the lower part of the eye, a short distance from the cornea. A small quantity of vitreous had evidently escaped. The wound gaped, and its lower edge was prominent, and stood away from the upper margin, which was somewhat depressed. A single suture was introduced about the middle of the wound, and brought the divided parts into apposition. The patient progressed most favorably, and the wound completely united; the presence of the stitch produced no irritation. On April 27th, the eye was free from redness and seemed to have completely recovered from the accident; but on testing his vision, he could only count fingers, and on examination with the ophthalmoscope, an extensive detachment of the retina was seen to correspond with the site of the puncture.

Mr. Windsor's case is recorded in the paper already referred to, (l. c. p. 5.) He was called to see a child whose left eye had been injured two or three hours previously. The injury was inflicted with a large blunt curved knife. On raising the lid, an incised wound was found, commencing in the inner and upper side of the cornea and extending through the sclera backward for fully half an inch; there was a nodule of iris in the anterior part; the rest of the wound was gaping widely, and through it vitreous was bulging, though none appeared to escape. Mr. W. at once thought of ligature, but it appeared unadvisable to him to give chloroform, as the child was certain to cry and struggle and the least effort would force more vitreous out of the wound; he therefore decided to wait. He applied a bandage to the injured eye, and closed the other by plaster.

The patient was kept in bed for some time; hardly any inflammation occurred, and the wound gradually contracted.

Progress being slow, it was determined to remove the prolapsed iris, which was done under chloroform. This had a beneficial effect, the anterior part of the wound was soon firmly healed, the posterior part uniting also for a little distance further.

[1] Royal London Ophth. Hosp. Reports, vol. vii. part 1, p. 14.

In November, the centre was still open and allowed the vitreous to project; the bandage was tightly applied, and continued until December 27th, when, as the prolapse of vitreous increased rather than diminished, chloroform was given, the projecting nodule excised, and a suture passed through the middle of the wound. As the edges of the wound were thickened, endeavor was made to pass the thread obliquely through it.

The stitch, when drawn tightly, completely closed the wound. A bandage was applied. The next day the parts immediately around the wound were injected, and there was some pain. On the 30th, less congestion, and the suture had cut partially through.

A day or two after, the suture came away spontaneously, and on January 6th, the wound appeared quite closed. On the 20th, the cicatrix was quite level and all irritation had gone. When last seen, (February 24th,) the wound was quite healed. Pupil of good size, but displaced inward with a rather large coloboma. He reads slowly No. 5, and letters of No. 4 Jaeger. Media and fundus normal.

These are, so far as I have been able to find, the recorded cases, in which suturing of the sclera has been resorted to for wounds of the eye, and I will now add to them my own case. The fact that the subject was fresh in my mind when this case offered, had no doubt some influence in determining me to try it, and, as will be seen, the result was fully as satisfactory as in any of the cases I have enumerated.

James O'Neil, aged 32, a fireman, was admitted to Charity Hospital January 27th, 1873. Four days before, while chipping steel, a piece flew off and struck his right eye, causing a wound which bled a good deal at the time. The evening following the injury, the eye was very painful and he had flashes of light in it. Upon admission to the hospital, examination revealed a large horizontal wound of the sclera fully $\frac{1}{2}''$ in length. It was situated at the lower and outer part of the eye, and extended into the cornea. The iris was adherent to the corneal wound, but did not prolapse. The edges of the scleral wound were gaping widely, and a nodule of vitreous protruding.

The tension of the eyeball was greatly diminished —T. 3.

He could only count fingers at 3'. Examination with the ophthalmoscope showed considerable opacity of the vitreous, from hemorrhage, but not sufficient to prevent a reflex from the fundus; no details, however, could be made out. The visual field was normal.

As it seemed to me quite impossible to bring the edges of the widely separated wound together without a suture, I introduced a simple, very fine, black silk thread through the middle of the sclerotic part of the wound.

The needle was passed by means of the needle-holder in the ordinary way, from without inward, except that I passed it obliquely through both edges of the sclerotic, without penetrating its whole thickness.

When tied, the suture exactly adjusted the edges of the wound, and completely prevented the further escape of vitreous. A pressure bandage was now applied, atropine instilled, and the patient put to bed. The next day, (January 29th,) the patient had passed a good night, there had been some pain in the eye, but not enough to keep him awake. The edges of the wound were in apposition, and no vitreous escaping. Pupil ovally dilated. There was but little injection in the vicinity of the wound.

February 1st.—The wound having firmly and evenly united, I removed the suture, continuing the bandage. The eye was quite free from pain or irritation. The case continued to progress favorably, and on the 8th of February the patient was discharged. The tension of the globe was now normal; vision had risen to counting fingers at 10', but the vitreous was still too opaque to allow a good view of the fundus. The field of vision was complete. The cicatrix was smooth and even, but the iris remained adherent to the corneal wound. I did not see the patient after he left the hospital. I have now enumerated (including my own) six cases in which this procedure was resorted to, and all of which terminated favorably.

Mr. Windsor's case is particularly instructive, for it shows that union may be effected by the use of a suture, even though the edges of the wound may have been separated for a long time. In view of this fact, he suggests that this method might

be employed with success in cases of fistulæ of the cornea and sclerotic.

Chloroform was not given in my case; but in performing the operation upon children, it would undoubtedly be necessary, to prevent a further escape of vitreous.

In all of the cases we have cited, the stitch produced little or no irritation, and in most of them was allowed to come away spontaneously. I should prefer to remove it, however, after a firm union of the wound had been accomplished. This is rendered much easier if a black thread has been employed. In conclusion, it seems to me that in all cases of wounds of the sclera or cornea in which the wound gapes, and when union is not readily accomplished without, a suture may with advantage be applied.

REPORT OF ONE HUNDRED AND FOURTEEN EXTRACTIONS OF CATARACT. By H. Knapp, M.D., of New-York.

During the last four years and a half, I made in the city of New-York 114 extractions. In this number all cases of cataract, complicated and uncomplicated, that I have operated on are included, except such in which a recent traumatic lesion had done some serious injury to the eyeball. The *results* I have obtained are less favorable than those I had in Europe. This, it seems to me, is due to a greater percentage of unfavorable cases I have had to deal with in America. Of the 114 eyes, *I have lost* 13, which is more than twice as many as I lost in Heidelberg. Among the losses I have included all cases that could not count fingers at the distance of a foot. Some of them would probably gain useful sight by an after-operation; but in preparing statistics we have to note things as they actually are, not what they are capable of being. There were 9 eyes which obtained only moderately good sight, namely, from $\frac{1}{200}$ to $\frac{1}{20}$, and 92 had good sight, from $\frac{20}{200}$ to $\frac{20}{20}$.

Methods of Operation.—One hundred eyes were operated on by Graefe's method, with a loss of 12 eyes; 13 by Weber's method, of which one eye was lost six months after the operation, the individual being a drunkard of the lowest class. One eye was operated on by Le Brun's method with S $\frac{20}{20}$, but with extensive anterior synechiæ. Weber's operation I did, in 1871, thirteen times in succession, but gave it up in spite of the good results, on account of its uncertainty and accidents to which it is liable. I pointed out the advantages and disadvantages of Weber's method at the meeting of the American Medical Association in 1872, in a paper pub-

lished in the Transactions of that Association. I have followed Graefe's method with the following deviations. The *centre of the flap* touches, or nearly touches, the upper transparent margin of the cornea. The section is as linear as Graefe's, with no partial return to the flap. It seems to me that this location of the wound is sufficiently removed from the ciliary body so that the operation and its consequences leave the deeper parts of the eye uninvolved. I *circumcise* with a cystotome that portion of the *anterior capsule* which corresponds to the whole space of the pupil after a broad iridectomy has been made, and endeavor to remove the circumcised piece of capsule with the cystitome or the forceps. Where I did not succeed, the piece of capsule mostly came out with the cataract. In expelling the lens, I gently depress the posterior lip of the wound with a broad spoon, and press upon the cornea from its lower margin upward, while an assistant steadies the eye with the fixing forceps.

Of the *accidents during the operation* I will here mention only the *escape of vitreous*, which happened 10 times, twice in the 13 Weber's operations, and 8 times in the 100 Graefe's operations; it occurred only 3 times in cases of ordinary cataract; the remainder were in cases of immature, (1,) disciform, (1,) Morgagnian, (2,) and hypermature (3) cataracts.

In five instances I was obliged to *force* the extraction of the lens by introducing *instruments* into the eye, namely, once, successfully, a sharp hook, and four times a broad spoon, upon which three eyes were lost. I appreciate the danger inherent to all traction instruments, especially that of large spoons, which I employ only when there seems no prospect of removing the lens by any other means. Spoons are, it seems, the most dangerous, yet the only reliable traction instruments. Since they have been used in the worst cases only, my statistics should not be adduced to disapprove of their applicability in general. In eyes otherwise healthy, they seem to do comparatively little damage, as is demonstrated by the experience of A. Pagenstecher and others, who use a large spoon in almost every extraction of the lens together with the capsule.

Among the *abnormalities of the healing process* which were observed, I mention the following:

(*a*) *Spongy exudation in the anterior chamber*, three times, results good.

(*b*) *Partial suppuration of cornea, with puriform exudation in the anterior chamber*, was twice successfully treated by making vertical incisions into the infiltrated borders of the wound and evacuating the anterior chamber.

(*c*) Two cases of *plastic capsulitis;* the inflammation began in the upper segment of the capsule, and traveled around the borders of the excised piece of capsule; leaving the centre of the pupil free and the vision unimpaired.

(*d*) One case of *purulent capsulitis*, ending in closure of the pupil and S $\frac{1}{\infty}$ with F complete. The patient did not reappear; his case, therefore, is counted among the losses.

(*e*) One case of *irido-cyclitis.* It was a bad operation, the knife was blunt, vitreous escaped, and the immature cataract had to be removed with the spoon. The patient had two nuclear cataracts with transparent cortices, saw badly, and had come from some distance, the State of Michigan. All this misled me to operate on him. His was the worst case in the whole series, and the only one in which I have to reproach myself for having operated on an eye without proper indications, and moreover, having done the operation badly by neglecting to test the edge of my knife. In the third week, the iris bulged forward and the pupil was crater-shaped. I performed an iridectomy without benefit. I have not heard from the patient since he left the hospital a year ago. The conditions of his operated eye were such as might produce sympathetic trouble in the fellow-eye.

(*f*) *Iritis and hyalitis* with following closure of the pupil and S $\frac{1}{\infty}$ were observed in two patients; the one leaving this city for Porto Rico; the other, two years later, for the next world; and neither having yet returned, I had no opportunity of improving their sight by an iridectomy, but had to register the two among the failures.

(*g*) *Iritis simplex*, leaving pupillary obstructions impairing the vision to a certain degree, was observed in eleven cases.

(*h*) *Detachment of the retina* was noted once, namely, in the case of the drunkard above mentioned, who had been operated on successfully by Weber's method. As the detachment oc-

curred only some months after the operation, in a debauched person, I do not know whether I did right in counting his case among the failures.

I performed *fifteen after-operations* in this series of 114 extractions, which is less than I used to perform formerly. The reason of it is, that of late years I have endeavored, and almost always with success, to remove the central portion of the anterior capsule, which leaves the pupil less obstructed than when the capsule is simply lacerated. The after-operations consisted of twelve *discissions*, some six months or a year, the majority within the first six weeks after the extraction. None of these operations was followed by a noteworthy reaction. I made the incision with one or two sickle-shaped needles when the opacities in the pupil were recent, and with a Graefe's or Beer's knife, when they were old and tough. Twice the operation left the visual acuteness as it was; in the other it increased it materially. Besides these discissions, I made iridectomy in three other cases—the one to arrest cyclitis in the case before mentioned, the two others in cases of dense pupillary membranes—in the one with tolerably good result, in the other destroying an eye which before counted fingers at five feet. In this case, which looked very favorable, and would undoubtedly have done well had I made an ordinary iridectomy, I tried a new method of operating. I made an opening into the lower segment of the cornea with a lance-shaped knife, then thrust the sharp-pointed blade of a delicate pair of scissors through the iris and cut it obliquely upward and outward; then I carried the blade of the scissors back to the first point of the incision and made a second incision, nearly at a right angle with the former one, upward and inward. The angular piece of iris thus formed, contracted toward its attached base, and left a beautifully clear pupil. The patient had pain during the night; purulent iritis and panophthalmitis followed from the second day. This kind of angular iridectomy tempted me by its rational appearance, yet I had tried it with the same unfortunate termination not long previously. This was in an eye where closure of the pupil had followed traumatic cataract. I made the first steps of the operation as I did in the case just related; then I endeavored to pull the

retracting triangular piece of iris out, in which attempt I did not succeed. Suppurative iritis followed, produced, I thought, by the bruising of the iris in the endeavor to draw a piece of it out. Since the avoidance of such bruising in the second case did not obviate suppuration, I made up my mind never to try again this operation, which I may style "angular iridotomy."

The preceding remarks form only a part of the report, yet I thought it proper to limit them on this occasion when so many important things claim your time. I have confined myself to observations of a directly practical nature, leaving the detailed discussion of the subject to a publication in the Archives of Ophthalmology and Otology.

REPORT OF TWENTY-FIVE CASES OF MEDIAN FLAP EXTRACTION. By Henry W. Williams, M.D., Boston.

Since October 18th, 1872, I have performed median flap extraction in twenty-five cases; the upward section being made according to Le Brun's method in nine cases, the lower section according to Liebreich in sixteen. Anæsthesia by etherization in all the cases.

The corneal wound united without ulceration in all the eyes operated on, though in five instances the healing process was a little delayed by slight protrusion of the iris at one extremity of the section, and there was subsequently some anterior synechia. In one case, where the results were perfect as regarded the operation, there was found to be so much atrophy of the optic nerve that the patient could only distinguish features. One eye was lost, in a very cachectic person, from hyalitis. In another instance, one eye suffered from iritis implicating the capsule and requiring its removal from the eye; but there is every reason to expect good results from a secondary operation to free the pupil from adhesions, the patient being even now able to see the time by a watch with this eye. Two other cases had partial closure of the pupil by adherent capsule, which will require laceration.

All the other eyes operated on obtained good vision, reading ordinary print, though in three patients the number of glasses was not recorded through inadvertence.

October 18th, 1872.—Mr. ——, æt. 70. Semi-hard cataract, both eyes. Lower section. Discharged November 4th. Sees well at distance with right eye with $+4\frac{1}{2}$, and reads with $+3$. In left eye, partial adhesion of the capsule to margin of pupil will require a slight secondary operation.

October 24th.—Mrs. ——, æt. 61. Hard cataract, both eyes. Lower section. Discharged November 15th. +7 for distance, +3½ for reading.

November 8th.—Mr. ——, æt. 62. Semi-hard cataract, both eyes. Lower section. Discharged November 23d. Well. Glasses not recorded.

November 18th.—Mrs. ——, æt. 65. Hard cataract, both eyes. Upward section. Discharged November 28th. +4½ for distance, +2½ for reading.

November 25th.—Mr. ——, æt. 71. Semi-hard cataract, right eye. Upward section. Discharged December 13th. No accidents as regards operation; but sees only to distinguish features with +6, on account of atrophy of optic nerve.

December 13th.—Mrs. ——, æt. 71. Hard cataract, both eyes. Lower section. Discharged December 24th. +4½ for distance, +2½ for reading.

December 13th.—Mr. ——, æt. 74. Semi-hard cataract, both eyes. Lower section. Discharged December 30th. Good vision. Glasses not recorded.

December 16th.—Mr. ——, æt. 55. Semi-hard cataract, right eye. Lower section. Discharged December 27th. +4½ for distance, +2½ for reading.

December 25th.—Mrs. ——, æt. 65. Hard cataract, right eye; semi-hard, left eye. Lower section. Discharged January 8th, 1873. +4 for distance, +2½ for reading.

April 2d, 1873.—Mr. ——, æt. 68. Hard cataract, left eye. Lower section. Discharged April 15th. +5 for distance, +3 for reading.

April 14th.—Mr. ——, æt. 60. Semi-hard cataract, right eye. Lower section. Discharged April 28th. +4 for distance, +2½ for reading.

April 18th.—Mrs. ——, æt. 51. Semi-soft cataract, left eye. Lower section. Inflammation of capsule and hyalitis, requiring removal of capsule on 20th. Good union of corneal wound, but closure of pupil by adhesions to hyaloid. No vision. A very cachectic subject, whose other eye had been previously operated on unsuccessfully.

April 18th.—Mrs. ——, æt. 43. Semi-hard cataract, both eyes. Lower section. Discharged May 9th. Slight anterior

synechia in right eye; but good vision in both eyes. Glasses unrecorded.

June 9th.—Mrs. ——, æt. 74. Hard cataract, both eyes. Lower section. Discharged July 4th. Slight anterior synechia, but sees well at distance with $+4\frac{1}{2}$, and reads with $+2\frac{3}{4}$ with right eye. Partial capsular adhesions in pupil of left eye requiring laceration.

June 13th.—Mr. ——, æt. 65. Hard cataract, right eye; semi-hard, left eye. Lower section. June 17th. Inflammation of iris and capsule in left eye; the capsule was removed with fine forceps through the centre of corneal wound. Discharged June 28th. Right eye sees well at a distance with $+4\frac{1}{2}$, and reads with $+2\frac{3}{4}$. August 4th, sees to tell time by a watch with left eye, but the pupil is partially closed by adhesions.

ON THE IMPORTANCE OF AN ACCURATE RECORD OF ALL OPERATIONS FOR CATARACT AND THE RESULTS OF THE SAME, WITH SOME PRACTICAL SUGGESTIONS.

By Hasket Derby, M.D., Boston.

Those of us who were present, a few years ago, at the first meeting of this Society in New-York, can well recollect the numerous and radical changes that have occurred, in our own time, in the accepted method for the extraction of cataract, the capital operation of ophthalmology. Hardly any one of the leading operations of general surgery has passed, within a much more extensive period, through such vicissitudes. At the commencement of my own practice and in the city of Boston, I found a respectable number of the older practitioners adhering to the time-honored reclination, and even discission, of senile cataract; while our president was striving for the introduction of flap extractions, then in general use in Europe. To him belongs the honor of demonstrating to his younger colleagues, fresh from the schools of the Continent, the safety and advantage of anæsthetics, which they had been taught to discard, for this purpose. It is needless to-day to refer to the general applicability and entire safety of the agent which our experience teaches us to deserve the title of the anæsthetic *par excellence*, to the exclusion of chloroform, nitrous oxide, and the newer and fleeting fashions of the day.

Following in rapid succession on the general revival in this country of flap extraction, performed under the influence of sulphuric ether, came the modification by Mooren, the scleral flap of Jacobson, the outspooning of Waldau, Critchett, Bowman and Pagenstecher, and in 1865 the peripheric linear

method of our illustrious von Graefe. Its general adoption divided our ranks into rival, though numerically unequal, camps. On the one side were the advocates of the pure or variously modified flap; on the other, the adherents of the linear or nearly linear cut combined with iridectomy. One side has striven to convince the other by theoretical arguments as well as by practical statistical proof; with what result, every colleague present has undoubtedly formed a clear opinion.

Very recently, the question of the best operation has been reopened by Liebreich, and the median corneal cut without iridectomy has been largely practiced and highly extolled. Many of the advocates of the corneal flap have ranged themselves on the side of this new method, still in opposition to the views of the school of von Graefe. Again are we called upon to decide as to the relative advantages of two procedures, so widely at variance that it is safe to assert that one will, in the long run, be found to offer better results than the other. Preconceived opinions and personal predilections must here be set aside, and the question settled, as settled it most undoubtedly will be, by the logic of facts and figures. To urge the systematic and accurate attainment of the same, by means of concerted action, is the object of this paper.

For, after all, why should not our collective experience be brought to bear on this as well as similar questions, instead of caviling at and often only grudgingly accepting the tables furnished by foreign journals? And why have we in America and England lagged so far behind our continental brethren in the accumulation and publication of operative statistics? With the labors in this field, already made public, we are all familiar. Von Graefe's project of giving to the world his accurate tables of all his cataract operations, however performed, a project long cherished and in part doubtless matured, was interrupted by his untimely decease, and his bare results are to be met with in various disjointed summaries. It is unnecessary to more than refer to the series of three hundred extractions so carefully analyzed by Knapp, to the table of nearly as many operations mostly performed by Snellen at the Utrecht Hospital, and so conscientiously and exactly noted, and to the very full reports of the cases operated on at the

Clinique of de Wecker, published in the years 1872 and 1873, and embracing upward of three hundred operations, besides several smaller tabular statements by various, mostly German, colleagues.

Against all of this what have we to show? The institution from which, of all others, the most might have been expected in this regard, maintains an unbroken silence. For the Royal London Ophthalmic Hospital Reports shed but a feeble light on the question of the best operation for the extraction of cataract; the more recent rich experience of Moorfields Hospital has as yet, and for the rest of the world, been accumulated in vain. While here in America the Infirmary of Dr. Knapp in New-York and the Boston Infirmary are the only ones that have, to my knowledge, even attempted to array their results in a form available to the seeker for truth. Three out of the four last published reports of the Massachusetts Charitable Eye and Ear Infirmary contain a careful, and the last a somewhat extended statement of its annual operative experience in this direction. Beyond this all is a blank. We do indeed find stated in infirmary and hospital reports the number of cataracts operated on during the year, but there the record stops. "We exist," say they, "we operate, we invite charity, we receive patients, we dispense instruction. Our results are our own business, and in them those outside have no share."

An able surgeon recently commenced an article on ovariotomy and his experience therein, with the enunciation of his belief that those who published no statistics did so because they had none they could publish. A statement of this kind, made with reference to American ophthalmologists, would be justly scouted by those familiar with their known skill. Have we never, however, reflected that our conduct in this regard has exposed us to such an imputation?

During the past spring, I addressed circulars to all the active members of this society, inviting a statement of their comparative experience in the operations of von Graefe and Liebreich, and requesting a *résumé* of the statistics on which their opinion was based, when it had been thus formed. I received

twenty-three answers, which may be briefly analyzed as follows:

5 expressed a decided preference for Liebreich's operation.
6 an equally decided opinion against it.
12 had formed no opinion.

11 had never done Liebreich, being satisfied with existing methods.

1 had statistics "unfit for use."

1 had fifty-eight per cent "good results" by Graefe, but gave no figures or standard.

1 had done one Liebreich, no result given.

1 had done two Liebreichs, no result given.

1 had done fourteen Liebreichs, one result given, (V. $\frac{18}{100}$;) had also done one hundred and fifty Graefes, but "kept no accurate statistics, has wholly discontinued doing so."

1 had done twenty Liebreichs, no result given.

And finally,

1 had done one Liebreich V. $\frac{20}{70}$

1 had done two Liebreichs { V. $\frac{15}{100}$ / V. $\frac{20}{100}$

1 had done four Liebreichs { V. 0 / V. $\frac{1}{\infty}$ / V. $\frac{20}{30}$ / V. $\frac{20}{30}$

We obtain thus a total of forty-four operations done according to the method of Liebreich, results being furnished in eight cases.

Comment is needless!

Whatever course now our English brethren may see fit to adopt, it is, I think, self-evident that a persistence in our present plan of neglecting the accumulation and comparison of the results of our operative experience is incompatible with the idea of progress and improvement. Unless every new operation for cataract is to run the course of the fashions of the day, to be accepted or assailed on theoretical grounds, to be commended for its novelty and deserted for a yet more novel successor, we must seek to establish its worth on a more solid basis, and to judge it by its results. I feel fully justified

in laying down the rule that it is the duty of every surgeon who undertakes the removal of a cataract to record the facts in the case, and to take the trouble to ascertain the amount of vision that the patient ultimately acquires.

I am aware that the objection will be at once raised that such a course is impossible in hospital practice—that patients often leave so unexpectedly, before the expiration of a proper period of convalescence, or before the opportunity of a suitable examination has been afforded, that an accurate determination of the amount of vision in every case is a simple impossibility.

That, with the most earnest effort and unsparing pains, there may always be a certain number of unrecorded cases, I readily admit. But that the percentage of such cases may steadily be diminished, and ultimately, by personal assiduity, be reduced to a minimum, my own experience has amply proved. And the means I have found most efficient has been the Cataract Register I herewith submit to the inspection of the society. It consists, as will be seen, of a series of parallel columns, arranged under the following heads:

No. of case.
Name.
Age.
Index of reference (that is, page of hospital or private records where full history and details of case are given.)
Diameter of cornea.
Dilatation of pupil under atropine.
Perception of light.
Projection.
Date of operation.
Remarks on same.
Length of after-treatment.
Vision (with date of testing) for Far.
" " " " " " Near.

Subsequent history.

Were this, or some similar record-book, conspicuously displayed in the office of every ophthalmic hospital; were the name, particulars of case, and date of operation of every

patient entered by the assistant, and the surgeon himself made responsible for the filling out of the remaining blanks, the wealth of valuable material that is now recklessly flung away would be, with each year, more and more thoroughly utilized. Why should not we emulate our German brethren in this regard, and why should not each member of this society bring to its annual meeting some such record of his labors? Be his operations one or many, be his method this or that, be his results favorable or the reverse, it will at least be an honest effort to accumulate a fund of knowledge and experience, profitable to our successors and accruing to the benefit of humanity.

I will simply add one or two suggestions that have occurred to me as a result of my own experience, and which may perhaps be found worthy of being brought forward at the meeting of the Ophthalmological Congress in 1876, for concerted action.

1*st. Tables of cataract operations by a single method, intended to serve as a basis of comparison with the results of other methods, should include only cataracts that are neither the result of local injury, tangible local or general bodily disease.*

Under this rule, all traumatic cataracts, those resulting from any intra-ocular affection known to have previously existed, from diabetes, etc., would be excluded, or at any rate separately catalogued.

2*d. In recording vision, the full fraction should be stated, the number of test-type seen, and the distance in which it is actually seen, no attempt being made to reduce the fraction to lowest terms.*

3*d. The test card should be artificially illuminated by a light of fixed power, placed at a stated distance from the centre of the card.*

It is to be hoped that the International Society will, at its approaching session, fix both the intensity and distance of the source of illumination.

4*th. The date of testing, as distinct from that of the performance of the operation, should be invariably stated. And*

every effort should be made to ascertain and record any variations in vision that may subsequently occur.

5th. A definite standard of success should be agreed upon; that is, that fraction should be settled which must be at least equaled by the acquired vision, in order that the result of the operation may justly be regarded as successful.

By an adoption of these or similar rules, it is at once evident that the existing amount of confusion would be greatly reduced, while many sources of mistake would be removed and many apparent discrepancies obviated or explained. Absolute precision, entire accuracy of statement, can of course only be approximated to. Even as in mathematics the exact ratio between the diameter and circumference of a circle can be sufficiently approached though never precisely attained, so the gradual elimination of error after error from our statistical tables will in time lead to results so full of truth that their slight imperfections may practically be overlooked.

REMARKS ON CATARACT EXTRACTION — SUGGESTIONS FOR SECURING GREATER PRECISION IN REPORTING OPERATIONS AND RESULTS — FORM OF THE CORNEAL SECTION.

By John Green, M.D., of St. Louis, Mo.

It is evident from the discussions of the past year or two, that the majority of ophthalmic surgeons are not yet satisfied with established operations for cataract extraction, but are still busy devising and testing new methods. With the exception of those operators who still adhere more or less closely to the "peripheric-linear" method of von Graefe, we now find but few exclusive advocates of any particular operation. Methods and modifications of methods, variations in the details of the operation and in their combination, have become so numerous as already to defy nomenclature; general statistics, therefore, classifying operations under a few heads, according as they happen to resemble, more or less closely, some established or well-known method, are no longer sufficient for purposes of comparison; but we require instead, from each operator, a methodical record of all extractions performed, together with a precise indication of the manner in which each essential stage of each operation has been conducted. Thus, and thus only, can we hope to secure records which shall afford data for definite conclusions as to the advantages and disadvantages of particular modes of procedure.

In recording and tabulating our cataract extractions, we should note, in each case, the exact form, extent, and position of the corneal section; the character and extent of the iridectomy, if iridectomy has been performed; the manner of opening the capsule or otherwise dealing with it; and the measures

adopted for facilitating the exit of the lens. We should also record in detail any complication or defect in the completed operation, and in the immediate result of the healing process; and in estimating the final result, we should, in addition to giving the measure of the acuteness of vision, be careful also to detect and note any irregularity in the healing of the corneal wound, any synechia or other irregularity of the pupil, any remains of capsule or other pupillary obstruction, and any abnormal condition of the vitreous or of the fundus as shown by the ophthalmoscope.

The record of the form, extent, and position of the corneal section, the character of the iridectomy, and the ultimate form and condition of the pupil may be illustrated by simple diagrams, with the very great advantage of showing these details of the operation and result as they have appeared to the eye of the operator, and so supplementing and correcting defects and inaccuracies of statement. Such diagrams are best drawn upon engraved blank forms, which may be printed in any light color and gummed on the back, like a postage-stamp, for insertion in the case-book. The forms which have suggested themselves to me as most useful are three in number, namely, a front and a profile view of the cornea, and a front view of the iris.

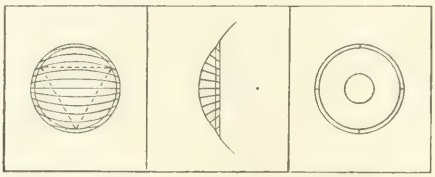

Fig. 1. Fig. 2. Fig. 3.

Figures 1 and 2 represent a front and a profile view of the eye, with great circles drawn upon the cornea; the two concentric small circles indicate respectively the anterior and posterior boundaries of the cornea. Figure 3 is the same as Figure 1, omitting the great circles. Upon these blanks, lines illustrative of the case to be recorded are drawn in ink, the printed lines serving merely as guides to their accurate delinea-

tion and interpretation. To reproduce the diagrams in connection with printed tables of statistics, it is only necessary to engrave them in very fine or dotted lines, with heavier lines to mark the course of the incision, etc. This can be most easily managed by lithography, by transferring any desired number of the engraved blanks upon a fresh stone and marking in the heavy lines with the pen.

This use of diagrams to illustrate reports of extractions has been suggested by a model which I have found useful in studying and demonstrating [illegible]

about great-circle or linear incisions has been based upon operations in which the actual section has been a small circle or flap. Each of these two forms of section has its especial advantage and disadvantage. The great-circle cut opposes greater resistance to the exit of the lens, but, for the same reason, it tends to close more perfectly and heal more quickly. The flap incision, on the other hand, lets out the lens more easily, but it does not close so perfectly, and is therefore longer in healing. The ideal form of section would seem to be not quite a great circle, but rather such an approximation to a great

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This use of diagrams to illustrate reports of extractions has been suggested by a model which I have found useful in studying and demonstrating the various corneal sections which have been proposed, or which may be proposed. The model consists of a sphere upon which two concentric small circles are painted, indicating the anterior and posterior boundaries of the cornea; two intersecting meridians made of stiff wire, which may be applied to any part of the surface of the sphere, afford the means of drawing great circles at will, and of testing experimentally any arcs which we may draw upon the surface of the cornea. Upon such a sphere we may measure off and lay out with the greatest accuracy any described corneal section, and immediately test it by applying to it the movable meridian.

Testing in this way the various sections hitherto proposed, it is easy to show that, with the single exception of the *Querschnitt* of Küchler, not one coincides exactly with a great circle of the cornea. Liebreich's modification of Von Graefe's section conforms perhaps most closely to a great circle; but even this, as it is described and figured, appears to be a low flap rather than a strictly linear cut.

It would seem, therefore, that much that has been written about great-circle or linear incisions has been based upon operations in which the actual section has been a small circle or flap. Each of these two forms of section has its especial advantage and disadvantage. The great-circle cut opposes greater resistance to the exit of the lens, but, for the same reason, it tends to close more perfectly and heal more quickly. The flap incision, on the other hand, lets out the lens more easily, but it does not close so perfectly, and is therefore longer in healing. The ideal form of section would seem to be not quite a great circle, but rather such an approximation to a great

circle as shall render the exit of the lens easier, without at the same time too greatly retarding the first closure of the wound, and the reëstablishment of the anterior chamber.

A very simple relation exists between the several measurements of the cornea and lens which may serve as a convenient guide to the accurate execution of sections like that of Liebreich. Taking the measurements of the cornea and lens as given by Arlt, (*Archiv für Ophthalmologie*, 1857,) we have for the anterior diameter of the cornea, 5‴; for the diameter of the anterior chamber, $5\frac{1}{2}$‴; and for the diameter of the lens, a little more than 4‴. Now the length of the chord of a corneal arc of 120° (or the side of an equilateral triangle inscribed in the transparent cornea) equals $\sqrt{3}r$ or $4\frac{1}{3}$‴, and by making both puncture and counter-puncture in the sclero-corneal zone, we may secure a length of available section somewhat exceeding $4\frac{1}{2}$‴, which in this position appears to afford ample room for the extraction of a large and firm lens. This relation is indicated in Fig. 1 by the dotted triangle inscribed within the circle of the cornea.

[NOTE.—The stamps, represented in Figs. 1, 2, and 3, may be advantageously used in connection with the form for recording statistics of cataract extractions lately adopted by the American Ophthalmological Society. A specimen sheet is furnished with this volume of the Transactions.]

LIEBREICH'S EXTRACTION OF CATARACT.—DISLOCATION OF LENS, AND FAILURE TO ESCAPE.—REOPENING OF WOUND NINE DAYS AFTER.—EXTRACTION OF LENS.—GOOD RESULT. By D. B. St. John Roosa, M.D.

The following case presents, I think, some curious features, that may make it worthy a recital to the Society. Mrs. Van P., æt. 62, was operated upon by me for cataract of the right eye, in the fall of 1872, with the final result of V.=$\frac{2}{200}$. On the 29th March, 1873, she was admitted to the Manhattan Eye and Ear Hospital, for the purpose of the performance of the same operation upon the left eye. The patient had submitted to the first operation, without ether, with great coolness and composure, and I therefore decided to attempt the second one also without anæsthesia. Liebreich's section was made, but with some difficulty, due to some extent to the restlessness of the patient. The counter-puncture was made a little more internal, to the margin of the cornea than I intended, and consequently the incision was rather small, but I have known the lens to escape readily from quite as small an opening. After incising the capsule, repeated and careful attempts were made to extract the lens in the usual way, and then by means of the hook, but they all failed, until finally the lens became dislocated into the vitreous, and a small quantity of the latter fluid escaped. I then determined to push the lens still farther into the vitreous, which I did and closed the eye. No reaction of any significance followed, and the pupil was found partially clear, and the patient was able to count fingers at a few inches from the eye. On April 7th, or nine days after, the lens had appeared in the upper portion of the anterior cham-

ber, peeping out into the pupil, and I determined to attempt to remove it. The patient was placed under the influence of ether, and the upper lid being held open by my colleague Dr. Loring, I fixed the eyeball with forceps, and with a narrow Graefe's knife I proceeded to open the corneal wound as nearly as possible in the line of the first incision, which was firmly united, lengthening it a very little. I then, by means of a cystotome placed under the lens, brought it out from its position, and from the eye, without losing a drop of vitreous, so far as could be determined. The wound healed, with a slight adhesion of the iris along a part of the corneal wound, and vision $\frac{20}{70}$ resulted, with which the patient was discharged thirty-seven days after the second operation.

HERPES ZOSTER OPHTHALMICUS OF THE LEFT SIDE, CAUSING LOSS OF THE CORRESPONDING EYE, AND SUBSEQUENT LOSS OF THE OPPOSITE EYE. By H. D. Noyes, M.D., New-York.

Mrs. A. H., widow, born in England, æt. 50, came to the New-York Eye and Ear Infirmary, March 3d, 1873. She was totally blind and in feeble health. Eighteen months before, while in England, she had an attack of violent neuralgic pain in the left side of the head and face, attended by an eruption of herpes. The skin was much swollen, and the inflammation raged so severely that she was kept a month in bed. During the progress of the disease, the left eye became inflamed and totally blind. In June following, that is, ten months afterward, the other eye became painful and inflamed and vision was destroyed. There was no attack of herpes on this occasion.

Present condition is as follows: All the left half of the forehead is covered by deep cicatrices of the skin, as if the tissue had been burned. The eyebrow has been partially destroyed, and some scars can be found in the scalp. Some scars exist on the side of the nose, showing that the eruption had occupied this situation. There is partial anæsthesia of all the scarred surface, and occasional attacks of neuralgia now take place in it.

Patient says that she was always myopic. In the left eye, there is no perception of light, the pupil is occluded, and the picture is that of old irido-choroiditis.

In the right eye, which became sympathetically diseased, there is quantitative perception of light, but no projection of a candle flame upward or inward. Tension normal. The

lesion consists in irido-choroitis, and consequent cataract. The globe is sensitive to pressure, while the cornea of the left eye is in a state of almost perfect anæsthesia.

The above case is remarkable for the destructive results of herpes zoster ophthalmicus, in causing directly the loss of one eye, and remotely the loss of the remaining eye. The disease was attended by such violent neuralgic symptoms that no doubt could be entertained that the essential pathology of the case must conform to the usual fact, namely, organic lesion of the ganglion of Gasser. The evidences of implication of the trigeminus nerve were perfectly distinct and palpable.

In the tabulated cases of Hybord, ninety-eight in number, no case of loss of sight in both eyes is related. (For a *résumé* of the paper by Hybord, see *New-York Medical Journal* for June, 1873, p. 642.)

TWO CASES OF HERPES ZOSTER OPHTHALMICUS DESTROYING THE EYE. By B. Joy Jeffries, M.D., Boston, Mass.

1st Case.—March 14th, 1873, a man, æt. 52, applied to me, from whom and his wife I obtained the following account. Thirty-four days ago, he noticed his left eye a little blood-shot, and his forehead, eyelids, and side of his nose became red, and "awfully swelled" within the next two days. The parts were very painful, and he had intense "neuralgic" pain over his head on the left side. An eruption appeared, which left scabs, lasting two or three weeks. He insists that he had no sleep for the first week, and has had no good rest for three weeks. He presents all the appearance of a man exhausted by a severe attack of ophthalmic shingles. There are still some crusts up to the hair, also on the nose and lower lid; one on the brow, over the exit of the frontal nerve. There is pain all over the scalp on the left side, although but little blush of the surface. Patient can not distinguish any difference of sensation on the two sides. The upper lid is swollen and droops a little over the lower. The man can not open this eye. The globe is injected, and the cornea looks badly inflamed and infiltrated. A four-grain solution of atropine was ordered, and quinine freely. March 22d, 1873, there is still some pain over the forehead. The cornea is sloughing in parts. March 26th, the cornea has opened with an irregular slough, and the aqueous flows off. No pus runs, and no pain. April 11th, 1873, the cornea has healed with a flattened cicatrix. No pain. 19th, cornea flat, less irritated. Vision a "white cloud." 25th, the same. The quinine and atropine have been continued. May 2d, 1873, less pain in head. The patient feels it in cold weather. May 9th, 1873, no pain now. Continue quinine.

2d Case.—Mrs. Blank, æt. 64, states, for several years she has had frequent headaches in the morning. Commencing at least ten days and nights before Sunday, September 8th, 1872, she had neuralgic pain of steadily increasing severity, confined entirely to the right side of the head. On Wednesday, the 11th, her physician was called and prescribed hot applications. An eruption appeared during the following two or three days, over the scalp, forehead, and side of the nose to the tip, on right side. This eruption, when out, was called erysipelas. Nothing was applied to limit it. The eruption was all out by the end of a week. The patient was relieved of the hard pain when it appeared. Crusts then formed, one on the forehead, over the exit of the frontal nerve. The crusts came off by the end of a week, but re-formed. The right eye seemed greatly affected, the lids so swollen as to close it. The symptoms were so bad that by the following Sunday a solution of nitrate of silver was ordered, one drop to be used at a time. As this solution did not seem to be of benefit, it was made stronger. The globe was not so painful, but the lids secreted. Her physician said the eye "was like a ball of blood." The stronger solution was used a week, but the patient complained of its being too painful, and a zinc wash was substituted. She could see for the first few days, but by the second Sunday after the commencement of the attack vision was gone. These statements were definitely given, and corroborated by her daughter, bringing her to me, October 4th, 1872.

The patient then presented a person weak and feeble, evidently worn out with pain consequent on a severe attack of herpes zoster ophthalmicus, in the right side, marked traces of which she now bore. The whole affected surface, namely, scalp, forehead, and side of nose, was intensely red. A large crust still remained on the scalp in front of the vertex. Reddened scars showed where other crusts had been. The patient was still suffering from considerable pain. The right eye was tender to touch, through the lids. Ciliary redness, and a large central slough of the cornea, stained with nitrate of silver. There was marked sympathetic irritation of the other eye, so that enucleation was thought of, somewhat prevented by the

patient's weak condition. A solution of atropine, grs. iv. to ℥ j., was applied to the eye several times a day, the patient kept quiet, and quinine given freely. Her general condition at once improved. By October 7th, the upper margin of the cornea was seen and the pupil behind, the anterior chamber existing. Ten days later, the symptoms were somewhat better; the light can now be more freely borne by the left eye, previously extremely sensitive. She complains of neuralgic pain of peculiar character, "prickling," and "stinging of bees." The patient went home, a short distance from the city, in greatly improved bodily condition.

November 5th, 1872, I saw her again. The last crust, from near the vertex, came off to-day, about two months from commencement of disease. The peculiar numbness complained of has now disappeared. There is, however, a difference of sensation; namely, a loss of it over the affected parts. There is still a redness and blush over the skin. The left eye is again more sensitive to light than when she went home. She attributes it to taking cold, that special day, in the cars. The globe does not present so much ciliary redness. More than half the size of the cornea, there is a circular, central crust, exactly the appearance of the incrustation round the mouth and stopper of a vial long used for solution of arg. nit. It has a dry, dull, metallic lustre, and quite opaque, and looks as if the sloughing substance of the cornea had united with the silver. Above, there is a clear enough ring of the cornea for the patient to count fingers through. There is some anterior chamber, but the aqueous evidently drains through this silver crust.

November 22d, 1872, eleven weeks after the commencement of the attack, I again saw the patient, who still complains of some soreness over the scalp and eyebrow. This soreness is growing less. She repeats, it is not pain, but "soreness in the skin." There is yet a blush over the surface. The left, unaffected eye she can use better. The right has darting pains. The cornea looks worse than November 5th, as if slowly sloughing away. There is no anterior chamber, and vision is gone. It looks as if the scale of crust would slough off. I have not seen the patient since.

In my Boylston Prize Essay on Diseases of the Skin, published two years ago, I said, in reference to herpes zoster: "New facts about it are, that it has been now seen on all the different regions of the skin, from the head to the feet, on the inside of the nose, and on the tongue. It has been noticed to occur repeatedly in the same individual. It not very unfrequently appears on both sides of the body at the same time, and then, perhaps, not over corresponding nervous tracts. It affects one side of the body as often as the other. It is more common in April, May, October, and November. It may occur as early as ten, seven, or five months; is not uncommon in children. It may be accompanied or followed by paralysis. It may leave lasting or permanent neuralgia, and that of an intense character. It may be followed by dangerous sloughing, and finally, in the aged, it may cause fatal prostration. When affecting the ophthalmic nerve, it has naturally attracted the attention of ophthalmic surgeons, who have especially studied it, and report that it may greatly injure or destroy the eyeball."

The reports since published give this curious disease a still worse reputation. Dr. Weidner reports a fatal case in the *Berliner klin. Wochenschrift*, Jahrgang 1870, No. 7. Prof. E. Wagner, another in the *Archiv der Heilkunde*, Bd. 11, 4 Heft, 1870, p. 321. Prof. Oscar Wyss, of Zurich, a third, in the same Archiv, No. 12. This last case was most carefully dissected by Prof. Horner with Prof. Wyss. Death occurred during the attack of ophthalmic shingles, from œdema of lungs, due to the extensive purulent deposit causing possibly capillary embolus from the detritus, fat, etc., originating in the ophthalmic vein.

Prof. Horner said of this case, that the strictly pathological alterations in the eye were of two kinds: one set associated with the herpes zoster, as such, (cornea, iris, and ciliary nerves;) the other due to the phlebitis of the ophthalmic vein. To the latter he joins the considerable extravasation of blood in the choroid and retina, the vessels of which were filled to their utmost.

As long ago as 1861, Barensprung, from his dissections, had asserted that "zoster depends on a disease of the ganglionic

system, and in special cases on irritation of some one of the spinal ganglia or the Gasserian; yet the peripheric irritation of a nerve having ganglionic fibres in it may be followed by a limited eruption of zoster vesicles."

Now, Prof. Horner's dissection, in the case of ophthalmic shingles above mentioned, showed inflammation of the Gasserian ganglion, which, as it were, completes our evidence. Prof. Wyss concludes that his case teaches us "that zoster is a typical disease of the skin, caused by inflammation of the Gasserian ganglion, or of one of the spinal ganglia and the nerve passing through it. Ganglion as well as nerve may be partially affected. [NOTE.—This means not separately, ganglion of itself or nerve of itself, but a portion of the ganglion with its corresponding portion of nerve, whilst the rest of the ganglion and nerve remain intact.] In cases where the whole cutaneous nervous distribution of one branch is not affected by zoster, but only one region of a single branch, then we may assume simply a partial affection of the ganglion and nerve."

As another instance of the destructive and serious character of zoster, I would briefly mention a case reported in the May and June numbers of the *Annales d'oculistique*, 1872, by Dr. Hubsch, of Constantinople. Prof. Hebra, of Vienna, diagnosticated and treated the case as one of chronic herpes zoster. There gradually came on white atrophy of both optic nerves; seen also by the late Prof. Graefe, at Berlin. Furious delirium supervened, and the patient, when last seen, was fast hurrying to the grave, with evident signs of diffuse encephalitis.

Dr. Albert Hybord published, last year, an interesting monograph on ophthalmic zona and the ocular lesions caused by it. He has sketched and analyzed ninety-eight cases, so far reported. The list includes the four cases I have previously given, one of which ended fatally. He concludes: 1st. Ophthalmic zona is an herpetic eruption developed over the territory of the first branch of the trigeminal. 2d. Ocular alterations coëxist with the cutaneous eruption, the most important of which are keratitis and iritis. These may exist together or singly; keratitis more frequent than iritis. 3d. Zona is the cutaneous expression of irritation or inflammation of distinct parts of the nervous system, (mixed nervous trunk, sensitive

trunk, spinal ganglion, posterior sensitive root, posterior columns of the cord.) 4th. Ophthalmic zona is the cutaneous expression of irritation or inflammation of the first trigeminal branch. The process causing the eruption may be developed in the Gasserian ganglion, or in the track of the ophthalmic branch. 5th. The lesions of the cornea and iris belong to the same class of phenomena as the cutaneous; they are due to irritation or inflammation of the ciliary twigs of the nasal branch of the ophthalmic division. Most often they correspond to the distribution of the eruption in the cutaneous territory of the nasal nerve. 6th. The cutaneous eruptions and the ocular lesions are not dependent on the paralysis of the vasomotors and consecutive neuro-paralytic hyperæmia. They must be referred to the direct influence of the nervous system on nutrition. Of all the theories suggested, the one seems most satisfactory and simple which attributes these trophic troubles to irritation of the trophic nerves.

To return now to the two cases of ophthalmic shingles I have reported above. In one, I have the direct testimony of the attending physician; in the other, that of the patient and daughter, that they were thought to be erysipelas. The nitrate of silver solution used in the one case could, of course, only add to the patient's pain and discomfort, if it really did not cause the loss of the eye. The eye was properly treated in the other case, by solution of atropine. Though zoster has now been repeatedly reported double on other portions of the body, no unfortunate creature has yet been seen with double ophthalmic shingles. We could wish an enemy nothing worse. Since Mr. Hutchinson, in special, wrote about this disease, cases have been apparently more often seen. This is because it is now recognized, and not so likely to be mistaken for erysipelas, with which, of course, many cases must have been formerly classed. I regret not being able to add something satisfactory in reference to treatment of the disease, or our means of controlling the lasting or permanent neuralgic pain following an attack. As this is passing through the press, I have under my care another extremely interesting case where remedies have afforded very great relief.

TRAUMATIC RUPTURE OF THE CHOROID, WITHOUT DIRECT INJURY OF THE EYE. By B. Joy Jeffries, M.D., Boston, Mass.

A young man, æt. 19, in September, 1871, was running into a barn, when his forehead struck a projecting timber, by which he was stunned. He was not, seemingly, much injured, the effect of the blow soon passing off. On the third day subsequent, he noticed "black specks before the left eye." For instance, as he was shooting on the beach, he imagined a flock of birds coming from the distance. For a month or two after this, he "could not tell a horse from a dog," and then could distinguish a portion only of an object. He judges his sight, in this respect, was worse than now. There are now, March 3d, 1872, no cerebral symptoms. No muscæ volitantes. Externally the eye looks perfectly healthy, and the media are clear. His field of vision, as taken by my register, would require a cut to be here given.

Search being made with the ophthalmoscope, disclosed an, at first sight, quite healthy fundus and nerve. With the direct or upright image, however, there were seen two peculiar white, brilliant crescents, as choroidal scars, up and out from the nerve. Without my being able to say that the retina was detached or plicated, it certainly had in this region, including the crescents, a peculiar, glistening look, like a reflection from a brilliant, rough surface; toward the macula, also, the choroidal vessels could be seen, although with difficulty. The possibility of a separated retina having subsided, was suggested.

THE CAMERA LUCIDA APPLIED TO THE OPHTHALMOSCOPE. By Henry D. Noyes, M.D.

For the purpose of facilitating the execution of sketches of the fundus oculi, I have sought the aid of the camera lucida, and, after a variety of failures, have, by the help of Mr. Grunow, microscope maker, of New-York, succeeded in making it available.

It is needless to relate the contrivances which proved unsuccessful, and I will briefly describe what Mr. Grunow has made for me:

I have employed a mirror of 13″ focal length and 3″ diameter, mounted on a sliding brass stem, capable of swinging at any angle. To form the inverted ophthalmoscopic image, I use a biconvex lens, similarly mounted, of 6″ focus and 4″ diameter.

The mirror is placed at 13 inches from an argand burner, and about 4 feet from the patient; between the gas-light and the patient a screen is placed to protect his eyes and the aerial image from direct rays of the light.

The arrangement is precisely that modification of the usual way of showing the inverted image in fixed ophthalmoscopes which Mr. Carter, of London, adopted. Its essential quality consists only in using a mirror of large diameter and a lens of long focus.

The camera lucida is a bit of glass shaped after Wollaston's suggestion, so as to give two total reflections, and thereby the image is made to appear erect. The size and form of the prism are represented in the cut.

This is inclosed in a box of thin metal, blackened, and is held in place by means of a tube attached to it which is thrust

into the central hole of the mirror. It projects thus in front of the mirror, and of course destroys a small amount of reflecting surface.

The paper on which the drawing is to be made lies on the table in front of the mirror, and is tipped up at such an angle as to present a plane parallel to the exposed lower face of the prism. It is within easy reach of the hand, and permits the tracing to be done with the same facility as if it were looked at in the usual way.

The pencil-point and paper are, by the prism, projected into the air with a perpendicular plane which coincides with the aerial image of the fundus oculi. In this way, the tracing-point is carried rapidly over the lines of the vessels and the contour of the nerve, and the exact relations and size and number of any pathological appearances are designated with certainty. To do this to better advantage, it is desirable to be able to vary the degree to which the paper and pencil are illuminated. A mirror of 7″ focus and 3″ diameter is placed near the gas-light, and made to reflect upon the paper at will. When the pencil-point can only be dimly seen because of the brightness of the ophthalmoscopic image, the second reflector, which is at the observer's left hand, at once floods it with light and brings it out clearly. On the other hand, if the image is feeble, the pencil must have only a corresponding degree of light.

Of course, in working with this apparatus the patient's pupil must be fully dilated, and it is indispensable that he be capable of fixing with perfect steadiness for a minute or two upon a certain spot.

In all fixed ophthalmoscopes the adjustment of the instrument and of the patient is troublesome. A rest must be provided for the patient's chin and head, and to get a clear image undisturbed by reflections is often a perplexing task, but a little practice secures it. To enable the observer to make slight motions in the position of the objective lens, a wooden rod is attached to it, which lies on the table.

An object must be provided for the patient to fix his sight upon, and this may be a bit of white card, a small taper, or any convenient thing.

The practical difficulty in this matter is, to keep the pa-

tient's eye absolutely fixed for one to three minutes, so as to get the sketch in at one sitting. I have found some trouble in this respect, but have not yet had much experience with the apparatus on the human eye. To make a sketch upon a working model of the eye, such as Nachet makes for teaching the use of the ophthalmoscope, is perfectly easy. The main purpose of the camera lucida is, to get the general outlines and correct relations of parts to be depicted; and the rough drawing thus obtained serves as a guide in subsequently filling up a more perfect sketch. If a large picture be desired, this can easily be drawn with the original outline as a model.

AN INSTRUMENT FOR THE DIAGNOSIS OF THE REFRACTION. By Dr. W. Thomson.

In the Transactions of this Society for 1870, will be found a description of an instrument for the determination of the refraction, consisting of four brass disks, variously perforated. To a fifth disk, which combines many of the advantages of the entire instrument, but which is especially suited for the diagnosis and correction of astigmatism, your attention is now invited.

This consists of a disk of thin brass, $1\frac{1}{2}$ inches in diameter, which can be placed in the trial-frames in general use, having, in its central part, ten perforations $\frac{1}{2}$ mm. each in diameter, and $\frac{1}{2}$ mm. apart, arranged in the form of a cross whose vertical stem is composed of six and its horizontal arms of five apertures. A scratch across the face of the disk, in a line with the stem, enables it to be placed at any angle in the trial-frames, so that the stem may correspond with any meridian of the cornea, and the arms with the meridian at right angles to it. The test object should be a small bright point of light at a distance of not less than sixteen feet from the patient, whose accommodation, when an accurate diagnosis is desired, should be entirely paralyzed. To an ametropic eye, free from astigmatism, the test light will be multiplied and will assume the form of a cross, and by passing a card in front of the disk, so as to cover seriatim the apertures forming the cross, we can distinguish myopia from hypermetropia; since in the former, as the card is moved from right to left, the lights disappear in the same order, whilst in the latter, they are eclipsed from left to right. Furthermore, the cross may be united into a single point by some + or — spherical glass, which will correct the ametropia and give the highest visual power.

When there is astigmatism, a spherical glass may remove either the stem or the arms of the cross, but it will not fuse all of the lights into one point, and in simple astigmatism, when the disk is placed to correspond with the best and worst meridians, the patient will see only a line of lights, a fact which any observer can confirm for himself by the aid of a $+\frac{1}{10}$ cylindric placed in front of the disk over his own eye. For the clinical correction of astigmatism, the meridians of greatest and least ametropia must be carefully ascertained by the circular opening advised by Donders, and the radiating lines introduced by Dr. Green. The disk may then be placed in the trial-frames with the stem of the cross corresponding to one of these, and by passing a card in front of each part of the cross, the refraction of each meridian, whether myopic or hypermetropic, may be separately ascertained. A spherical glass can now be found which will fuse into one the stem, and another the arms of the cross, and the combination of one of these with a cylinder equal to the other, will fuse the lights into a point and give an accurate correction. For example, I have recently seen F. M., age 13, myopic since infancy, and growing worse, whose sight is so defective as to prevent her education. At 6 in., the far point of either eye, she can read only No. 3—Sn=V.=$\frac{1}{6}$. With ophthalmoscope the vertical retinal vessels are seen with a $-\frac{1}{12}$, and the horizontal ones with $+\frac{1}{12}$. With the disk with stem placed in trial-frames at 90°, a light was seen as a cross, which was converted into a vertical series by $-\frac{1}{12}$, and into a horizontal one by $+\frac{1}{12}$, whilst a $+\frac{1}{12}\smile-\frac{1}{6}$ cy., axis 180°, fused them all into one point and increased her visual power to $\frac{20}{XXV.}$

T. H., age 25, an albino, is very myopic, being able to read only at four inches; spherical glasses gave her V.=$\frac{1}{12}$ only, and there was so much nystagmus as to render the diagnosis of refraction by the ophthalmoscope impossible. The disk was of great service here, and it was quickly ascertained that $-\frac{1}{10}$ gave a vertical, and $-\frac{1}{5}$ a horizontal series of light, whilst $-\frac{1}{10}\smile-\frac{1}{10}$ cy., axis 180°, fused them together and increased her V. to $\frac{1}{4}$. The nystagmus, absence of pigment, high degree of myopia and astigmatism, and low acuity of vision combined to render this case very difficult to diagnosticate, and the disk

above described was found in this instance to give greater precision, and with less expenditure of time, than with any of the other methods of examination at hand.

This simple instrument is, therefore, presented to your attention as a useful supplement to, and in part of substitute for, the more complicated one described at a former meeting.

AN INSTRUMENT FOR TATTOOING THE CORNEA.

By Dr. William Thomson.

Having recently met with two cases of central corneal opacity, where it seemed desirable to reproduce as accurately as possible the appearances of the black pupil, and not being satisfied with the grooved needle which I saw in use at Moorefield, where, in this operation, the commissure, at opening of the lids, was filled with the pigment, and the punctures were made through this stratum, I was led to give a trial to the one presented for your consideration.

It consists of a small steel pen, manufactured by Gillott, and known as the Lithographic Crow Quill, which has been fitted for this purpose, by having its point converted into a cutting surface by rubbing it flatwise upon a hone. Its barrel will receive the ink in sufficient quantity to complete, perhaps, the entire operation, and the pen should be held with its trough uppermost. It may then be made to penetrate the laminæ of the cornea obliquely, and by a slight lifting movement on its withdrawal, a portion of ink will be carried into the depths of each incision. The vision of the operator is not impeded by a quantity of ink overlying the cornea; he can easily perceive the effect of each puncture, and the leucoma may be stippled with as much precision as though it were composed of paper. In the two cases in which it was used, it fulfilled the above conditions, and both operations were followed by very pleasing results.

THE LIGHT-STREAK IN THE CENTRE OF THE RETINAL VESSELS. By Edward G. Loring, M.D.

At the meeting of the American Ophthalmological Society for 1870, I had the honor of reading a paper on the nature of the light-streak seen with the ophthalmoscope in the centre of the retinal vessels. The views expressed in this paper have since met with a good deal of opposition, the most strenuous, if not the most convincing, coming from Professor Nagel, who, in the first volume of his admirable bibliography[1] has felt constrained to allude to my paper as a "tissue of physical impossibilities," and to allege that the "appearances claimed to have been observed were as foundationless as the arguments based upon them."

To this very forcible, if not very courteous, criticism I have nothing to say, except that if the learned professor did not get the effect exactly as it is described in the paper referred to, he could not have performed the experiment in a proper manner; as not only were the appearances "claimed to have been observed" seen by all the members present, but the experiment has since been repeated by many other competent observers, with always the same result.

In the last number of the *Archive für Ophth.*, (B. 18, Ab. 1, p. 113,) Dr. Schneller has again taken up the subject, and publishes somewhat apologetically the results of his investigations, because he believes "that concerning these so simple matters of examination, the greatest possible clearness should prevail."

After a short introduction in regard to the nature of light and reflections in general, Dr. Schneller approaches the subject under consideration by observing that, "from what has

[1] Jahresbericht der Ophth., 1870, p. 208.

gone before, it will be readily inferred that I consider the clear streaks on the retinal vessels to be the image of the source of light produced by means of the anterior walls of the vessel."

This is the old view held by Van Trigt, and formerly by Jaeger, who latterly gave it up in favor of a reflection from the "blood-column."

Schneller now returns to this old view, which he supports by the following "positive proofs," the first of which is, that "the clear stripe is both in length and breadth of the required dimensions," that is to say, it corresponds, mathematically, with what it should, were it actually the reflection of the source of light.

To prove this, Dr. Schneller proceeds as follows: He supposes an examination to be made in the usual way, with two different ophthalmoscopes, the mirror of one having a radius of 44 cm., or, as is more commonly said, a focal distance of 22 cm., or 8½ Paris inches; the other, a radius of 28 cm., or a focal distance of about 5 Paris inches. The source of illumination is at 30 cm., or 11 inches, and is 18 mm., or ⅔ of an inch broad.

Rays coming from this source of light enter the examined eye, after reflection from the mirror, as convergent, consequently they must cross somewhere in the vitreous, and, at their place of crossing, an image of the source of light will be formed, inverted of course, and reduced. The place and size of this image will be proportionate to the distance and size of the source of light and the curvature of the mirror, consequently the result will vary for every mirror used. From well-known formulas, Dr. Schneller calculates for each of his mirrors the size and position of this image in the vitreous and in front of the retinal vessels, and, having obtained this, he then calculates what the size of the image of this image would be as reflected by the wall of the arteria centralis, looking thus on the wall of the vessel as a convex mirror with a radius of curvature for its first division equal to 0.1 mm., for its second 0.07 mm., and for its third 0.05.

Schneller from his calculations obtains as a final result, that the size of the image as reflected by the wall when seen with

the first mirror, the focal length of which is $8\frac{1}{2}$ inches, is $\frac{1}{2}\frac{1}{2}$ (or a little less than $\frac{1}{2}$) of the diameter of the vessel.

But with the second mirror, the focal distance of which is 5 inches, the image is only $\frac{1}{6}\frac{1}{5}$ to $\frac{1}{7}$ of the diameter of the vessel. That is to say, the light-streak seen with a mirror of 8 inches focal length is three times as broad as when seen with one of 5 inches! This disproportion is certainly startling, and it can be readily conceived that the image in question would speedily become invisible, when mirrors of only moderately short focal lengths were used. This conclusion has not escaped Dr. Schneller, who says, "From the above calculations it is self-evident why, in using mirrors of progressively shorter focal lengths, the light-streak becomes smaller and smaller till it even fades wholly away, and why in myopia it is smaller, and in hypermetropia it is broader than usual."

In answer to this first positive proof, I would say that it does not appear to me that facts bear out the conclusions, for the light-streak certainly does not appear to my eye, or any one's else, three times as broad when a mirror of 8 inches focal length is used as with one of 5.

Imitating precisely the same conditions used by Schneller, I get identically the same breadths of the light-streak, whether I use a plane, a moderately convex or concave mirror, that is to say, up to a focal length of 3, or even $2\frac{1}{2}$ inches.

Of the concave mirrors which I used, one had a focal length of $1\frac{3}{8}$ inches, another, one of only $\frac{7}{8}$ inches. With either of these mirrors the light-streak can be plainly seen. I must remark, too, that the illumination of the bottom of the eye with mirrors of such short curvature is exceedingly difficult, and can only be done satisfactorily when the eye is under atropine; for, on account of the great condensation of light by the strong concave surface, the pupil contracts violently and excludes a large amount of the rays.

The reason then why, when we use the stronger concave mirrors, we see the light-streak less plainly, is due to the fact that, when the rays cross each other at a considerable distance in front of the retina, the cone of light when it reaches the retinal surface has an ever-increasing base, and the rays an ever-increasing divergence, the more anteriorly they intersect;

so that fewer and less forcible rays strike upon the summit of the vessel, and consequently fewer come back to the observer's eye.

That the light-streak is less well marked in myopic eyes, may then be due to two causes: first, that with any given concave mirror the rays must cross each other, owing to the increased antero-posterior axis at a greater distance from the retina than in a normal eye: and secondly, because a great amount of light is consumed by the necessary correcting glass; while in a hypermetropic eye the reverse holds good—the cone is smaller and the rays striking the vessels are less divergent, and, *a priori*, it ought to be, as Schneller says it is, that the light-streak is more pronounced. The general illumination of all hypermetropic eyes is, from well-known optical laws, much more easily obtained and more brilliant than in myopic; but whenever a good general illumination can be obtained, so that the details of the fundus can be seen in perfect sharpness, then, too, will the light-streak be well marked, no matter what mirror we use.

Hitherto we have occupied ourselves with only one of the conditions of the problem, namely, the mirrors; and much more might be said in regard to them, but want of space forces us to another equally important factor, the source of illumination.

According to optical laws and to what the author himself lays down, the size of the image in the vitreous must vary with the position of the source of light, and consequently the size of the light-streak which depends upon this would also vary. The further the lamp was removed from the mirror, the narrower, and the nearer it was brought, the broader, would the streak become.

If now we take a seven-inch mirror, and make the ophthalmoscopic examination in the ordinary way, but move the lamp back and forth while the eye is always fixed on the vessel, which can be most readily done with the jointed lamp which most of us have in our offices; if we do this, we find that from the farthest extension of the lamp up to its nearest approach, there is no perceptible change in the breadth of the streak. If we repeat the experiment, except that we put the lamp at fifteen, or even twenty feet, we find that we still

get the light-streak in very nearly the same, if not the identical dimensions, as when the lamp was at one, instead of fifteen feet.

It is a little difficult, with the light at this distance, to get a proper illumination of the fundus, but with a little patience it is readily enough obtained, though the circle of illumination is, of course, very small in diameter, since the rays cross each other so far forward that the external rays of the cone strike the retina at such an angle that they are not reflected back; so then they enter the eye of the observer. It is only the most central rays of the cone that do this, and this holds good, for precisely the same reason, when mirrors of very short focal lengths are used.

Passing now to the third condition, the size of the source of illumination, we find that we may reduce the breadth of the flame at will, provided this has enough force to throw a circle, however small it may be, of well-defined illumination upon the retina. If this circle is only broad enough to cover a vessel, it is all that is needed.

We have, then, to recapitulate a phenomenon alleged to depend on three principal conditions: first, the curvature of the mirror; secondly, the size of the source of the light; and thirdly, its distance from the mirror. Now, it is mathematically demonstrable that, if any one of these conditions are changed, the result will be changed; and yet we have fundamentally changed every one of them, some to an enormous extent, and yet the result remains unaltered to any appreciable degree.

It is therefore proved *experimentally*, that the effect can not be due to regular reflection of the source of light from the anterior wall of the vessel.

Let us look now at the affair briefly in a mathematical point of view.

Schneller takes the diameter of the central artery of the retina, upon the authority of Henle, as 0.28 mm., and deduces from this that the first division of the vessel would have a radius of 0.1 mm., and a diameter of 0.2 mm.

I have already stated that the light-streak could be readily seen when the source of illumination was at a great distance,

and, assuming with Schneller that the radius of the first division is 0.1, I have had the curiosity to calculate what the size of the image would be as cast by the anterior wall of the retinal vessel, when an ophthalmoscope of seven inches focal length was used, and when the flame of the lamp was 23 mm. ($\frac{6}{7}''$) broad, and placed 20 feet behind the observed eye.

Rays coming from the lamp at this distance are practically parallel, and after reflection from the mirror, would meet, if uninterrupted, at its principal focus.

Intercepted, however, by the observed eye, the nodal point of which we will assume to be at one inch from the mirror, the rays will enter the eye as convergent, and the degree of their convergence will be precisely the same as if a biconvex glass of seven inches focal length occupied the place of the mirror, and the lamp was twenty feet in front of the glass.

As the rays enter the observed eye as convergent, they would meet in the vitreous, in front of the retina, and the eye which brought such rays to a focus on its retina, would have to be hypermetropic, and the degree would be equal to the glass used, minus the distance from the nodal point. In this case it would be $\frac{1}{7-1}=\frac{1}{6}$. H. $\frac{1}{6}$ equals a shortening of the normal axis of the eye of 1.6 mm. Consequently the image of the flame would be 1.6 mm.[1] in front of the retina, and the size of the image would be to the size of the flame as their respective distances from the second nodal point of the eye. The distance of the lamp is 20 feet, or 6504 mm. The size of the image would then be to that of the lamp as 15 mm. is to 6504 mm., or, expressed as a decimal, .002 that of the flame; and as this is 24 mm. broad, the actual size of the image in the vitreous would be 0.048 mm.

We have now, having obtained this, simply to calculate the place and size of the image of this image as reflected by the anterior wall of the vessel, the radius of whose curvature is 0.01 mm.

The place where this image would lie is obtained by the for-

[1] For formulas by which this is calculated, see Mauthner, pp. 67, 226, Ab. 1. Knapp's Archives, V. No. 2, p. 377. American Journal of Medical Sciences, April, 1870.

mula which Schneller uses: $\frac{1}{f'} = -\left(\frac{2}{r} + \frac{1}{b}\right)$ in which f' is the required distance of the image behind the curvature of the vessel, and b, the distance of the first image in front of the retina; that is to say, 1.6 mm. According to the above formula, the image would lie then 0.048 mm. behind the apex of curvature of the anterior wall of the vessel, and the size of this image would be to that in the vitreous, as their respective distances from the surface of the wall, that is, as 0.048 is to 1.6 mm. And as the size of the image in the vitreous is 0.048 mm., that of the vessel wall would be 0.00144 mm. Now as the diameter of the vessel, according to Schneller, is 0.2 mm., the light-streak, under the conditions taken, would be only $\frac{1}{139}$ of the diameter of the vessel.

The above figures, 0.00144 mm., give the actual size of the image of the source of light; but as we see the bottom of the eye under an enlargement of 15 diameters, we must multiply this by 15 to get the size of the image as it would appear to us: $0.00144 \times 15 = 0.021$ mm. This, as can be readily conceived, would be invisible to the naked eye. And if this is so with the first division of the vessel, what would it be with the third? And yet, the light-streak, as any one can convince himself, with the conditions taken is not only not invisible, but is to be seen under pretty nearly the same aspect as in the ordinary ophthalmoscopic examination.

It must be borne in mind, however, that the circle of illumination on the retina will be here as it was with the mirrors of short focal distance, exceedingly small, and for this reason a little care and skill will be required to get the effect.

There are three other positive proofs, in regard to which I should like to oppose some objections, did not want of space forbid. Turning then from what is purely mathematical and deductive, to what is really positive evidence of the author's views, we come to the following experiment.

"A glass tube, says Schneller, (*loc. cit.* p. 118,) filled with a solution of carmine, upon which the reflection of the flame has been cast by an ophthalmoscope, shows when the rod is perpendicular to the line of vision, a glittering stripe, which moves in the same sense with the image of the flame. If the

eye of the observer is moved sidewise from the ophthalmoscope, then a second stripe comes into view, of a dull reddish color, which moves in an opposite sense to that of the flame. The former is the reflection of the source of light from the anterior, and the latter that from the posterior wall of the cylinder. Both fade away when the tube is inclined from the plane which is perpendicular to the line of vision, the more diffused image from the posterior wall somewhat later than the other. If a reflector is now placed behind the tube, so as to form a contrasting background, say a piece of white, blue, or (what corresponds to the fundus of the eye) brownish-red paper, then the tube seems to be uniformly illuminated; still, when it is held in the right position, both of the above-mentioned reflections can be clearly seen."

"If the tube be a little inclined, and the streaks of reflection in themselves be weak, then the background is less concealed from view, and so clearly shines through, that printed matter, lying behind the tube, can be read. From which it follows that the ordinary solutions of carmine are more transparent than blood; and this is the reason why Loring saw the hole of the mirror which he used as a background, clearly defined."

The whole point of my experiment is so hopelessly buried in his last sentence, that we will not stop to resurrect it, but pass at once to those points which Schneller in his experiment brings forward to prove his part of the question. These are the reflections from the anterior and posterior walls of the tube.

Both of these reflections were noticed and commented upon when my paper was presented to the society, and they should, no doubt, have been dwelt upon when it was published, but they were discarded from playing any important part in the formation of the light-streak, on account of physical laws, which seemed at the time to preclude such a possibility; that is to say, the simple laws which govern reflections when light passes from one medium into another.

These views can not be better illustrated than by repeating the experiment performed by Schneller, which is similar to my own, with the important modification that instead of using behind his tube a highly polished surface, from which there is a large amount of regular reflection, he uses a piece of paper,

from which there is very little or none. In fact, his experiment is a precise counterpart of the one I made to refute the very thing which Schneller now tries to prove by it. It is but a repetition of my "Cylinder B."

Suppose then, a bit of small glass tube to be filled with a solution of carmine, and that this is placed against a background (slightly removed, however, from it) of white paper.

If now we cast the light of a flame against this tube with the ophthalmoscope, we get, as we should naturally expect, a glittering streak, corresponding to the apex of the curvature of the tube. This, as you are well aware, is the image of the source of light, and the same general effect is produced, whether we throw the light upon the tube with the ophthalmoscope, or allow the flame of the lamp to strike directly upon it. If then, for the sake of convenience, we expose the tube at the proper angle to the light of the single burner in the chandelier overhead, we get the same glittering streak along the vertex of the vessel.

In both cases this is unquestionably the image of the source of light; hence, argues Schneller, that in the centre of the vessel must be the same, and this would certainly be a strong argument in its favor, were the conditions the same in regard to the tube as to the retinal vessels. But it strikes me that these are widely different; for in the case of the tube we have the light passing through air, which has an index of refraction of 1, and striking against a curved surface of a medium, the index of refraction of which is 1.6, if the tube, as is commonly the case, is made of flint, and 1.533, if of crown-glass.

The difference here between the indices of refraction is very great, and we should *a priori* expect a brilliant reflection.

But the retinal vessels are not surrounded by air, but by media, the indices of refraction of which are almost identical with that of the wall itself. Indeed, the blood, the vessel-wall, the retina, and hyloid membrane, are all contained between an index of 1.34 and 1.35, a difference of only 0.01, and on top of these comes the vitreous, with an index of 1.339.

Under these circumstances, we should not *a priori* expect any reflection at all from the wall of the vessel, certainly not so

broad and brilliant a reflection as that under discussion. And if this is true, then we ought not to expect one rom the glass tube, which is a sufficiently exact representative of the retinal vessel, when this is subjected to the same conditions that hold good in the eye. It is impossible to imitate in any adequate manner the wonderful and complex mechanism of the eye, but a sufficiently exact imitation can be got of the conditions which govern the phenomenon under consideration, in a very simple manner: we have only to surround the glass tube by a medium which differs slightly from it in its index of refraction. From many fluids which might be used for this purpose, I select for the present experiments, solely as a matter of convenience, chemically pure glycerine, which has an index of refraction of 1.473.

If we now put the bit of tube with its white background—and I should have stated that in this case the tube itself is filled with glycerine stained red with carmine—if we place this in some proper receptacle, such as a shallow cup or capsule, such as sections of eyes are mounted in, and then expose the tube to the light so as to get, just as we previously did, the brilliant streak running down its centre, and then while we keep the eye fastened upon this, we pour the glycerine gently into the vessel, we see that the streak maintains all its brilliancy and integrity, while the fluid is gradually mounting up the sides of the tube; but the moment it reaches the vertex, and flows over the tube, that moment, just as we should naturally expect, the reflection vanishes, totally it seems at first sight, but by the very closest inspection, and by varying the position of the cup holding the tube, we can sometimes catch the faintest ghostlike remains of the minutest dimensions of what was the broad and brilliant streak of reflection running along the centre of the tube.

If we examine the tube, now covered with glycerine, with the ophthalmoscope, which can be easily done by placing the lamp below and looking down perpendicularly upon the vessel, the same result is obtained, only in this case there is a *total absence* of the streak of reflection from the wall.

In the experiment the tube represents the retinal vessel, and the glycerine the overlying media. The difference in the

indices of refraction between the two equals 1.60 — 1.47= 0.13, and, if no reflection is produced in this case, it is hardly possible that it could be, when the discrepancy is only .01, or thirteen times less.

A very simple and at the same time very striking exemplification of the above principle, on a larger scale, can be easily had by using instead of the small tube one of the positive cylindric glasses of the common test cases, of eight or nine inches focal distance.

Such a glass, so far as the anterior surface is concerned, may be looked upon as a portion of the anterior wall of an enlarged retinal vessel. If the plane surface of the glass be blackened or covered with dull, dark paper, then we get only the reflection from the anterior surface, and, if we now catch the reflection of the lamp overhead, we then get an image of it of great brilliancy and of sufficient size to be seen in all its detail. If we now pour in the glycerine at the side of the cup, in such a manner that it shall gradually rise over the surface of the cylindric glass, we then see the reflection, brilliant and distinctly defined as it is, fade away like magic the moment the fluid comes in contact with it, and the question is once more pressed upon us with redoubled force—how is it possible that the broad and brilliant light-streak of the vessels can be the result of reflection when the discrepancy in the indices of refraction between the walls and the surrounding media is so very insignificant?

If we use a common bi-convex lens, instead of a cylindric one, and so raise it from the bottom of the vessel that the glycerine will flow under it, we then see the reflection from both the anterior and posterior surface fade away as soon as the glass is covered by the fluid.

Having now destroyed, by the glycerine, the power of reflection from the walls of the tube, it would seem to follow that we had also destroyed the refractive power. But this is not so, and to prove it, we have only to repeat the experiment used in my first paper, and precisely like the one just given, except that behind the tube alpolished surface, an ophthalmoscopic mirror, is to be used, instead of an unpolished one; we have only to take the same bit of tube and place a mirror be-

hind it, the two being slightly separated from each other, and then to pour in glycerine till it rises over the tube. If we now examine the tube with the ophthalmoscope, we find, as before, not the slightest trace of reflection from either of its walls; but the moment we succeed in so casting the light upon the tube, that it shall be reflected directly back to us, that is to say, as soon as our line of vision is perpendicular to the axis of the tube, we see a beautifully marked, broad light-streak running the entire length of the tube, precisely as described in my former experiment.

The only interruption in the streak is precisely where the tube passes over the hole, and here it comes, on either side, to an abrupt ending, the lateral limits of the hole being sharply defined; showing clearly that where there is no reflecting surface behind the tube there is no light-streak. This experiment shows conclusively that here as elsewhere the power of refraction remains after that of reflection has been destroyed; or that, in other words, we still have a considerable amount of refraction where the differences in the indices of refraction are too small to admit of any appreciable amount of reflection; at least, whenever the reflecting surface is perpendicular, or nearly so, to our line of vision.

Schneller and others have laid great stress as an argument in favor of reflection on the fact that the light-streak is only visible when the vessel lies in a plane directly perpendicular to the line of vision. This is precisely the same whether the effect be due to reflection or transmitted light, as can readily be seen from the experiment; for it is only when just such conditions are fulfilled that the streak can be seen, and it requires not a little patience and dexterity, when glycerine is used, to bring the vessel into the required position.

Schneller also lays a good deal of emphasis on the fact that the light streak is "glittering" and of a "white color," whereas, if it were due to transmitted light, it would be reddish. I can not admit with him that the light-streak is in any sense "glittering," though in the arteries it is certainly oftentimes brilliant, nor to my eyes does the streak ever appear white, but rather of a pale straw color, with the slightest possible pinkish hue in it, while, even as the author

himself admits, in the veins, where the blood is darker, it not unfrequently seems to have a decided reddish tint. This pale straw color, bordering on the color of old parchment, ought not to seem strange to us when we think how very small the actual column of the blood really is, and that in the common ophthalmoscopic examination we see the vessels under an enlargement of thirteen to fifteen diameters, and under so brilliant an illumination.

From what has gone before, the writer is forced to the opinion that the phenomenon in question cannot be due to reflection from the *anterior wall* of the vessel, and that Schneller's views are not tenable, either from a mathematical or physiological point of view. If a reflection at all, this must come, as Jaeger says, from the anterior surface of the blood column. But precisely the same arguments against this meet us as those already urged at length against the anterior wall of the vessel. No reflection that would be visible could be produced here, unless physiologists have been utterly mistaken in the index of refraction of human blood, and it hardly seems possible that two such physicists as Sir David Brewster and Thomas Young could have been mistaken in their estimates. Both of these observers agree in putting the index of refraction of blood at 1.35.

Much that had already been written in support of my former paper has been omitted, because I have preferred to base my defense on actual experimentation. Instead, therefore, of producing any more arguments of my own, to which exception might well be taken, may I be permitted to bring forward one which can not fail to be of great weight with all who have interested themselves with physiological optics, and that is, that Giraud T. Teulon has had the kindness not only to repeat my experiments but to add others of his own invention for the solution of this problem, and that, through these, he has been led to precisely the same conviction that I have?

So far as appearances go, I readily admit that these are against my views, as the light-streak certainly seems, at first sight, to be the product of reflection and not that of refraction, and if there were any way in which the phenomenon of reflection could be reconciled with what we have been taught

to believe were the correct indices of refraction, it would certainly be more natural to attribute the effect to the former than to the latter. But how this can be possible with the accepted indices of refraction of the different media of the eye, I am at a loss to see. If, however, the indices hitherto given by the physicists are wrong, or have been incorrectly taken, then, of course, the foregoing views and arguments are also incorrect.

There is, moreover, one argument in favor of reflection which was originally brought forward by Jaeger, and now repeated by Schneller, which I can not satisfactorily meet, and that is that where two vessels cross each other the light-streak is not interrupted, as a rule, though it occasionally is seen to be when the vessels which cross each other are very small and apparently lie as nearly as possible in the same plane. We do, in this case, get an interruption, the light-streak forming a small quadrangular place at the point of crossing. This, it appears to me, can only be the effect of transmitted light, and the question arises whether the absence of the effect, in case of the larger vessels, may not be due to the fact that they do not cross each other in close contiguity, but are separated by intervening tissue, and, moreover, run at an angle to each other.

If, however, the tissue which lies immediately behind the vessel, and in which the latter is imbedded, could in any way act as a concave cylindric reflector, then the light-streak would not be interrupted when two vessels crossed each other. But to this suggestion, as to all others which have been presented, either by me or others, there are pros and cons which must be finally decided by higher authority.

The above remarks have been written solely as an answer to Dr. Schneller's objections to my former paper, and it appears to me that, although I myself may well be wrong in my views, Schneller certainly is in the demonstration of his, or, at least, that his arguments are entirely insufficient to give that convincing clearness which he seems so desirous of imparting in these "such simple matters of observation." But I must leave the further discussion of this subject to those who have more taste and a greater aptitude for deciding such problems.

I should, however, like to add here a few points connected

with the condition of the light-streak that may be of sufficient clinical importance to deserve mention.

Any disturbance in the media lying in front of the retina, naturally interferes with a perfect illumination of the bottom of the eye, and, inasmuch as the details of the fundus will be more or less obscured, the light-streak will be proportionately affected. Still, when even, on this account, only a moderately distinct view of the fundus can be had, the light-streak on the retinal vessels will be comparatively well marked, allowance being made for the general haziness of the media. But, on the other hand, though the media in front may be perfectly clear, the slightest œdema into the retina will cause the light-streak to be much diminished, or even to vanish entirely. And this takes place even if the œdema is confined to the immediate neighborhood of the vessel, and occupies, so to speak, only the perivascular space. Should the œdema be of any extent, the vessels have no central streak whatever, but present a uniform red appearance. This is markedly the case where the œdema is very pronounced, as it sometimes is in embolism or injuries from blows on the eye or in some forms of acute retinitis.

Without laying too much stress upon it, I have been led to look on this absence or presence of the light-streak as a useful and important sign in the differential diagnosis between troubles in the superlying media, especially in the vitreous, and haziness in the retina itself.

In some cases of overworked eyes, where there has been no other ophthalmoscopic sign, I have often noticed a decided diminution in the brilliancy and size of the light-streak, or even a total want of it, especially in the veins. I have attributed this to some slight impediment in the circulation and a consequent transudation of serum into the perivascular spaces, or tissue immediately surrounding the vessels. I have seen precisely the same thing in patients who have been suffering from some affection of the heart, though I have never been able to trace this, as Becker does, to the single condition of aortic insufficiency. Nor have I, as he does, attributed this reduction in size and brilliancy to the reduced calibre of the vessel; for I have seen cases where the light-streak was entirely

absent, even where the vessels were abnormally distended, and I have then thought it due to the abnormal condition of the blood, or the wall of the vessel or surrounding tissue which interferes with their usual transparency.

I have noticed, too, this disappearance of the light-streak in one or two instances of what afterward proved to be commencing separation of the retina, several days before the actual separation took place; the separation corresponding pretty nearly with the tracts of the retina where the light-streak was absent In one of these cases, the retina readjusted itself and remained applied for some three weeks, and then finally gave way. In another case, where the line of demarkation between where the light-streak was present and where it was not, in all the lower vessels, was well marked, and where, too, there was a corresponding limitation of the field of vision, no separation of the retina took place, and the œdema around the vessels, or what was supposed to be such from the absence of the light-streak, gradually passed off.

In actual separation of the retina, the light-streak is wanting.

I have also observed that the light-streak is absent, in different degrees, however, in many conditions in which the vessels themselves seem to have suffered from inflammatory action, especially in perivasculitis or perhaps inflammation of the wall itself, and where secondary atrophy of the tissue has taken place, with hypertrophy of the connective tissue elements. Thus the effect is often very pronounced in the secondary or atrophic stage of retinitis albuminurica, in those cases where the vessels themselves seem to have been involved and finally to have become reduced slightly in size. In these cases, the light-streak is often very much diminished or even entirely wanting.

Precisely the same thing takes place in some cases of retinitis pigmentosa, and oftentimes in the earlier stages of the disease where the vessels are just beginning to suffer a reduction in size, and where, as yet, the accumulation of pigment in the retina has not taken place to any considerable degree, or even where this is entirely wanting. And moreover, in these cases where the light-streak is absent, it is not universally so, that is, in all parts of the fundus; for it may still be present in all its

normal dimensions and brilliancy in some places, while in others it is much reduced or even wholly absent.

Precisely the same thing occurs oftentimes in those curious cases of retino-choroidal atrophy, occurring especially in old people with atheromatous arteries, and where, in different parts of the fundus, but usually near the macula, well-defined regions exist, which show an absorption of the choroidal epithelium, capillary layer, and pigment of the stroma, to such a degree that the larger vessels seem to be dissected out and to stand in vivid contrast with the adjoining parts of the fundus which still preserve a normal appearance.

I would say here that I do not allude at all to the well-known atrophic patches seen in choroiditis disseminata, or areolaris, where the retina itself is not usually much affected, but to that condition which Jaeger has described (and of which he has given two admirable drawings[1]) as atrophy of the pigment layer of the choroid.

It would appear that this diagnosis is not correct, or at least not comprehensive enough, since simple atrophy of the choroidal pigment layer never in itself produces any great disturbance in vision, as we see in posterior staphyloma, where not only the pigment-layer but almost the entire choroidal tissue has been absorbed. And in all these cases of ordinary choroidal disease, we very rarely if ever see scotoma—never, in fact, unless the retina is affected. But in the cases to which I allude, and in those which Jaeger has figured, we find great disturbances of vision and well-marked scotoma, showing that the retina is implicated, and it is in such cases that directly over and in the immediate vicinity of these circumscribed patches, the light-streak of the retinal vessels is often completely wanting. Through the kindness of Dr. Althof, I was enabled to present a beautifully marked example of this at the last meeting of the New-York Ophthalmological Society. In this case, that of an old woman of some seventy years, the light-streak could be seen perfectly well in some places, while in those parts of the fundus corresponding to the atrophic condition of the patches, it was either very much diminished or entirely wanting. I have also seen this want of the light-streak in some

[1] Hand-Atlas. Taf. xxii. fig. 97, text p. 165.

cases, chiefly among old people, where there was no other ophthalmoscopic sign, but where, from other symptoms, there was reason to believe that the vessels of the general circulation were more or less affected with atheromatous or amyloid degeneration.

So, too, in cases of what looks like simple atrophy of the disk, with shallow excavation, I have noticed this diminution or want of the light-streak, and a closer inspection then always reveals the fact that the fundus has a slightly hazy appearance with delicate changes in the choroid. And I have been led to believe in such cases that the retina itself was affected, and that the nerve-fibre layer especially participated in the trouble which was so plainly marked in the united nerve-bundles in the disk.

Whether in the foregoing and similar cases the above-mentioned absence of the light-streak be due to an abnormal thickening of the vessel-wall itself or that of the adventitia, or to a slightly œdematous condition of the tissue immediately surrounding the vessel, I am unable to determine, but I believe that at times it is due to all of them.

I would add that the light-streak is often of great service in determining the optical condition of the eye, especially in astigmatism; and the differential diagnosis between that want of sharp definition caused by an optical error, and the same effect caused by some abnormality in the condition of the membranes at the bottom of the eye.

A CASE OF SPARKLING BODIES IN THE RETINA.

By George T. Stevens, M.D., Albany, N. Y.

Z. M. is a clerk, twenty-two years of age, a native American, in good health, a full-chested, well-developed man. He onsulted me in May last on account of defective vision and of pain in the right eyeball. He had been conscious of a partial loss of vision for several years. The defect he described as if a feather or vail were hung so as to obscure a portion of the field of vision, while the remainder of the field was clear. He had been suffering from severe pain in and behind the eye for two weeks.

On testing the field of vision, there was found to be a loss of rather more than one fourth of the field, the upper and inner portion of the field being blinded. Opthalmoscopic examination showed the outer and lower portion of the retina to be illumined by hundreds of brilliant sparkling bodies. This exceedingly beautiful appearance was confined principally to about one fourth the retinal surface, though here and there, outside the limits of the greatest numbers, the glitter of solitary points could be seen.

These bodies seemed to be located in the internal (nerve-fibre) layer of the retina, or, possibly, in the internal limitans. None were below the level of the vessels, and many were seen to lie immediately upon the anterior surface of the veins and arteries. The retina, in other respects, revealed no indication of disease.

The facts relating to the history of the case, as communicated by the patient, are as follows:

In the summer of 1867, he was a passenger on board a steamer descending the Mississippi River. He was in perfect health, or, as he expressed it, "never better." While sitting

upon the deck of the vessel, quietly conversing with some friends, he was suddenly seized with a most violent pain in the eye, the shock feeling, as he says, "as though a needle had been driven through the eyeball." From that time he suffered intense pain in the eye for about two weeks; at the end of which time the pain gradually disappeared.

During this time the pain and intolerance of light were so severe that he made no effort to ascertain whether any vision remained.

When the pain at length subsided, he thought the eye well and took no further special notice of it for a year or more. Then, while serving as a clerk in a book-store, he observed that there was a partial loss of vision in one eye. Once after that, he thinks after an interval of another year, he suffered severe pains in the same eye, lasting a fortnight, and at the time of applying for counsel he had also suffered for two weeks. In neither of these latter instances could the pain be compared in severity to the first attack.

He has been a smoker for six years, but has used tobacco very moderately until within two years.

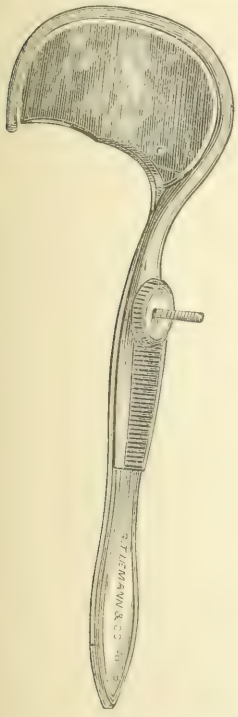
On examination of the heart, the impulse is found to be unusually strong, and, after vigorous exercise, there is slight irregularity. I detect no other evidences of disease of that organ. In all other respects he appears to be in perfect health.

May not the history of the case, and the location of the sparkling bodies, suggest that at the time of the attack of pain on board the steamer there was retinal hemorrhage, that the effused blood lodged in the nervous layer, spreading out in the direction of the nerve-fibres, the effusion thus assuming a sort of pyramidal form, and that after the production of these blood crystals (hæmoglobin or cholesterin) all vestiges of the effusion were removed, except the sparkling bodies?

DEMONSTRATION OF SOME NEW INSTRUMENTS.

By H. Knapp, M.D., of New-York.

The first instrument which I would like to submit to your kind attention is an *improved lid-forceps*. It has already been described by me in the first number of the third volume of the *Archives of Ophthalmology and Otology*. I need not, therefore, here dwell on the description of the instrument. I may say that it has rendered me and my colleagues at the New-York Ophthalmic and Aural Institute good service in various operations on the lids. The modification, which renders the instrument applicable to both eyes, seems to answer perfectly well. One inconvenience of the instrument is, that at its free end, namely the end which is farthest from the insertion of the handle into the plate, the plate yields to the pressure exerted by the lid, thus leaving the corresponding portion of the ring a little too much elevated, which renders the grooving of the fibro-cartilage less easy. This inconvenience is obviated by giving to the free end of the plate a higher level.



The second instrument is a "*hook for the extraction of foreign bodies from the interior of the eye.*" It is a small hook, grooved[1] and roughened at its concave

[1] Note.—The wood engraving wrongly represents the concave surface of he hook dotted. It should be striped.

side, made of flexible silver, so that its curve may be changed according to the requirements of the case. I have used this instrument for years with good results, and have a number of cases on record in which it rendered me excellent service. Those who have had opportunities to remove forei n bodies from within the eyeball, will know how unavailable forceps are for this purpose, the foreign body, in most cases, receding before the instrument, is pushed more deeply into the inner structures of the globe. The best instruments to extract foreign bodies out of the eye, and, in fact, the only available ones, are hooks and curettes. With these, you go behind the foreign bodies and draw them toward and into the opening through which you have introduced the instruments. I may add that in this way I have extracted successfully a number of foreign bodies from the *anterior chamber*, some from the *lens*, and a few from the *vitreous chamber*. Among the latter I may mention the case of a boy, who was seen by several of my New-York brother ophthalmologists. A gun-cap had penetrated the cornea and iris. It floated in the centre of the vitreous chamber, when I saw the case, two days after the injury. I made an opening into the vitreous chamber through the sclerotic, the boy being in the deepest chloroform narcosis; after an unsuccessful attempt with a delicate pair of anatomical forceps, I passed the hook behind the piece of metal and extracted it almost without loss of vitreous. I closed the scleral wound by a conjunctival suture, excised the iris which plugged the original wound, and had the pleasure of seeing an almost perfect recovery take place. The boy, when I examined him last, on July the 11th, that is about two weeks after the operation, had no cataract, no opacity in the vitreous, read with some difficulty Sn $1\frac{1}{2}$, and had a complete field of vision. There was a white scar visible with the ophthalmoscope, at the place where the opening in the vitreous chamber had been made, and some hyperæmia of the disc and its vicinity, where the foreign body probably had struck and was repelled.

The third instrument I beg leave to show to the Society is

a new *ophthalmoscope*. The practical improvements which of late have been made in the construction of ophthalmoscopes have reference to their use as optometers, thus aiding our examinations of the state of refraction, and making them independent of the answers of the patients. The advantage of having an instrument which admits this examination with the smallest loss of time, is felt by every ophthalmologist. A rotating disc behind the mirror, first employed by Mr. Rekoss, of Königsberg, and modified so usefully by Dr. E. G. Loring, of New-York, seems to be the best mechanical contrivance for using the ophthalmoscope as an optometer. Loring's three discs, however, cause considerable loss of time by changing from one to the other, and Cohn's modification, which puts all the glasses of Loring's three discs into one large disc of 3 inches in diameter, appears clumsy and unmanageable. Apart from these inconveniences, the discs in Loring's ophthalmoscope have not a sufficient number of glasses for the requirements of a careful ophthalmic practitioner. Some years before Dr. Loring constructed his instrument, I had a complete collection of small trial-glasses made which I could insert into an ordinary small (Liebreich) ophthalmoscope, and Dr. H. D. Noyes had his ophthalmoscope so changed that he could place behind the mirror all the numbers of his trial case of spectacles. All this, however, requires too much time for constant use. The ophthalmoscope which I have the honor to show you affords the greatest possible

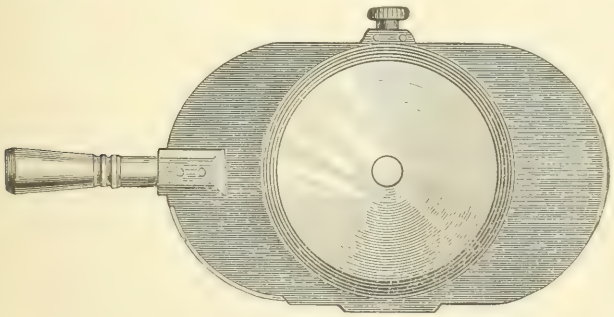


Fig. 1.

number of trial-glasses behind the eye, permits them to be rapidly changed, while the instrument is nearly as small as

Loring's. It consists of the ordinary mirror, behind which two discs can be rotated like the diaphragm in some—for instance, Kellner's—microscopes. In each disc are thirteen little aper-

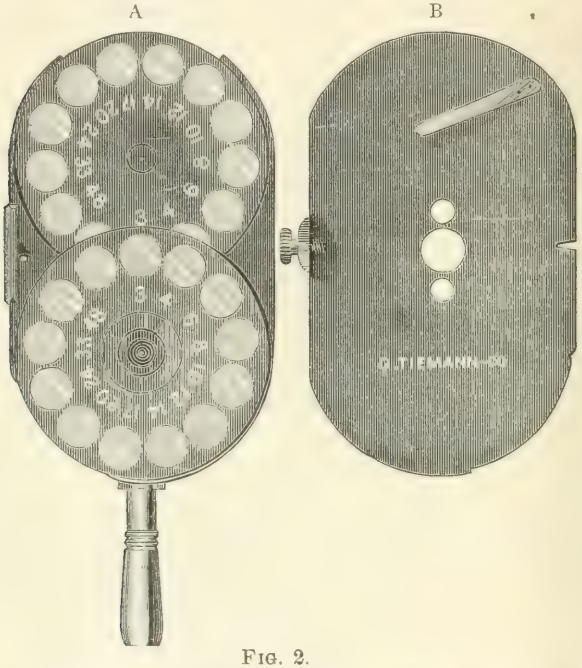


Fig. 2.

tures, twelve of which are filled with glasses, one being empty, (see Fig. 2 A.) One disc contains convex, the other concave glasses, in the following progression: 3, 4, 6, 8, 10, 12, 14, 17, 20, 24, 33, 48.[1] The intervals of refractive power between these numbers are as follows: between 3 and 4 = $\frac{1}{12}$; 4 and 6 = $\frac{1}{12}$; 6 and 8 = $\frac{1}{24}$; 8 and 10 = $\frac{1}{40}$; 10 and 12 = $\frac{1}{60}$; 12 and 14 = $\frac{1}{84}$; 14 and 17 = $\frac{1}{79}$; 17 and 20 = $\frac{1}{113}$; 20 and 24 = $\frac{1}{120}$; 24 and 33 = $\frac{1}{88}$; 33 and 48 = $\frac{1}{160}$. The weaker numbers which occur more frequently in practice, show very small intervals of refraction. These two series of glasses are sufficient for the majority of cases coming before the practitioner. To avoid, however, any loss of time, both discs are placed behind the mirror, and the change from one glass to any other is effected by a very easy rotation of the disc. The discs are held

[1] Note.—In the new instruments + 2 and — 2 are added.

place and protected from being soiled by a thin metal plate, (Fig. 2 B.) which covers the glasses from behind, whilst in front the discs are applied to the body of the instrument. The

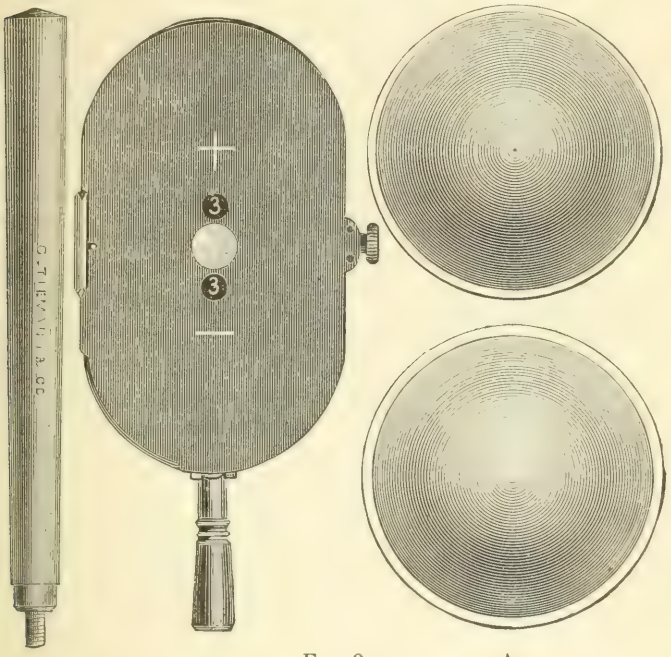


Fig. 3. A

cover has three holes; the middle one corresponds to the perforation of the mirror, through the two others, placed respectively above and below the central one, the numbers of the glasses can be read, (see Fig. 3.) The cover can be removed if the glasses require cleansing. The vertical diameter of the ophthalmoscope, the handle, of course, not included, is 60 millimeters, not quite $2\frac{1}{2}$ inches; its horizontal diameter is 35 millimeters, not quite $1\frac{1}{2}$ inches.

The instrument has, however, another advantage: the edges of the two discs overlap each other at the place of the perforation of the mirror, so that each glass of one disc can be superposed by each glass of the other disc, thus giving combinations of glasses which will satisfy all practical and scientific demands. It is easy to make intermediate numbers between the higher

numbers of the discs. If, for instance, you superpose —4 and +48, you have the number —4.33. If you superpose —4 and + 24, you get $-\frac{5}{24}$ or nearly — 5, and so forth. If you want to know the distance between two parts of the fundus oculi, for instance, the centre and the margin of the optic disc, you determine the position of one part by one disc, and add or take away so much refractive power by the other disc as is required to see the second part clearly. Say, for instance, that the centre of an excavated papilla appears clear with — 8. You then leave the disc of the concave glasses with — 8 behind the aperture in the mirror, rotate the disc of the convex glasses and find that convex 24 renders the margin of the papilla clear. Then the refractive difference between the margin and the centre of the disc is $\frac{1}{24}$, which indicates an excavation of 0.4 millimetres in depth. I need not multiply examples, as the use of the instrument is very simple. Messrs. Miller Bros., manufacturing opticians, 1223 Broadway, New-York City, have made the instrument with extreme neatness. Its whole thickness is only 5 millimetres.

Two objective lenses, (Fig. 3, A.,) No. 2 and No. 3, are added, and the whole instrument is contained in a case which is only a little more than half as large as Fig. 3. Its price is $40.

TRANSACTIONS

OF THE

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

TENTH ANNUAL MEETING.

NEWPORT, JULY, 1874.

NEW YORK:
WILLIAM WOOD & CO., 27 GREAT JONES STREET.

1874.

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MEMBERS

OF THE

American Ophthalmological Society.

ACTIVE MEMBERS.

Dr. C. R. Agnew	19 East 39th St.,	New York, N. Y.
Dr. Charles M. Allin	42 West 36th St.,	" "
Dr. H. Althof	40 West 36th St.,	" "
Dr. Joseph Aub	102 West Seventh St.,	Cincinnati, O.
Dr. Edwin W. Bartlett	115 Wisconsin St.,	Milwaukee, Wis.
Dr. Charles S. Bull	214 West 41th St.,	New York, N. Y.
Dr. F. J. Bumstead	32 West 26th St.,	" "
Dr. W. F. Carmalt	In Europe.	
Dr. Edward Curtis	27 Washington Place,	" "
Dr. Edward Delafield	1 East 17th St.,	" "
Dr. Francis Delafield	12 West 32d St.,	" "
Dr. Hasket Derby	12 Beacon St.,	Boston, Mass.
Dr. Richard H. Derby	111 East 25th St.,	New York, N. Y.
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Dr. Henry C. Eno	58 East 25th St.,	New York, N. Y.
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Dr. George C. Harlan	1806 Chestnut St.,	" "
Dr. Gustavus Hay	91 Charles St.,	Boston, Mass.
Dr. Edward L. Holmes	207 S. Clark St., N. E. cor. Adams St.,	Chicago, Ill.
Dr. Edwin Hutchinson	14 Bleecker St.,	Utica, N. Y.
Dr. B. Joy Jeffries	15 Chestnut St.,	Boston, Mass.
Dr. Samuel J. Jones	758 Wabash Ave.,	Chicago, Ill.

Dr. Charles J. Kipp	8 Centre St.,	Newark, N. J.
Dr. H. Knapp	25 West 24th St.,	New York, N. Y.
Dr. Edward G. Loring	151 Lexington Ave.,	" "
Dr. Arthur Mathewson	17 Clinton St.,	Brooklyn, N. Y.
Dr. R. J. McKay	107 West 22d St.,	New York, N. Y.
Dr. C. S. Merrill	49 Eagle St.,	Albany, N. Y.
Dr. H. G. Miller	262 Benefit St.,	Providence, R. I.
Dr. T. G. Morton	1421 Chestnut St.,	Philadelphia, Pa.
Dr. Russell Murdoch	12 Cathedral St.,	Baltimore, Md.
Dr. Homer G. Newton	17 Clinton St.,	Brooklyn, N. Y.
Dr. William F. Norris	1526 Locust Street.,	Philadelphia, Pa.
Dr. Henry D. Noyes	73 Madison Ave.,	New York, N. Y.
Dr. J. F. Noyes	101 Shelby St.,	Detroit, Mich.
Dr. Charles J. Pardee	72 West 35th St.,	New York, N. Y.
Dr. O. D. Pomeroy	33 East 29th St.,	" "
Dr. Thomas R. Pooley	106 West 34th St.,	" "
Dr. J. S. Prout	167 Clinton St.,	Brooklyn, N. Y.
Dr. Charles E. Rider	60 South Fitzhugh St.,	Rochester, N. Y.
Dr. C. A. Robertson	Hawk St., cor. State St.,	Albany, N. Y.
Dr. D. B. St. John Roosa	20 East 30th St.,	New York, N. Y.
Dr. W. W. Seely	118 West 7th St.,	Cincinnati, O.
Dr. Henry L. Shaw	159 Boylston St.,	Boston, Mass.
Dr. Francis Simrock	64 East 12 St.,	New York, N. Y.
Dr. A. G. Sinclair	70 Fort St., West,	Detroit, Mich.
Dr. George T. Stevens	47 Eagle St.,	Albany, N. Y.
Dr. Francis P. Sprague	9 Chestnut St.,	Boston, Mass.
Dr. George Strawbridge	1616 Chestnut St.,	Philadelphia, Pa.
Dr. William Thomson	1502 Locust St.,	" "
Dr. J. J. B. Vermyne	174 Union St.,	N. Bedford, Mass.
Dr. O. F. Wadsworth	84 Charles St.,	Boston, Mass.
Dr. David Webster	19 East 39th St.,	New York, N. Y.
Dr. Robert Willard	93 Charles St.,	Boston, Mass.
Dr. Charles H. Williams	15 Arlington St.,	" "
Dr. E. Williams	64 West 7th St.,	Cincinnati, O.
Dr. Henry W. Williams	15 Arlington St.,	Boston, Mass.
Total		61

HONORARY MEMBERS.

Dr. G. A. Bethune	166 Tremont St.,	Boston, Mass.
Dr. Isaac Hays	1525 Locust St.,	Philadelphia, Pa.
Dr. R. W. Hooper	114 Beacon St.,	Boston, Mass.
Dr. John Jeffries	15 Chestnut St.,	" "
Dr. E. Reynolds	7 Park Sq.,	" "
Dr. C. Schweiger	Berlin,	Prussia.
Dr. George Wilkes	16 North Washington Sq.,	New York, N. Y.
Total		7
Whole Number		68

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

Newport, *July* 16th, 1874.

The Society held its tenth annual meeting at the Aquidneck House.

The first session opened at 10.30 A. M., by the President, Dr. C. R. Agnew, of New York, who gave a brief introductory address.

The chair then appointed a committee to prepare a bulletin of papers to be presented, consisting of Drs. Jeffries, Rider, and Norris. Also a commitee on election of new members, consisting of Drs. H. W. Williams, Thomson, Green, Richard H. Derby, and Prout. The same Committee were by resolution charged with the duty of nominating officers for the ensuing year, and proposing the place of meeting.

The Secretary announced the death of two members during the year—Dr. Edward M. Curtis, of Sacramento, Cal., and of Dr. Lawton, of Syracuse.

The Treasurer's report was read, accepted, and referred to an Auditing Committee; viz., Drs. J. F. Noyes and Bull.

The Auditing Committee reported the Treasurer's account to be correct and duly vouched for.

The Committee on Bulletin then reported the following order of papers:

1. Case of Herpes Zoster Ophthalmicus. The whole side of nose involved without affection of the eye. By Dr. Wadsworth.

2. Six cases of Herpes Zoster Ophthalmicus, with remarks. By Dr. Jeffries.

In this connection Dr. Mathewson reported some cases under his own observation.

3. Two cases of interesting Syphilitic Lesion of the Eye. By Dr. Bull.

4. A case of Sympathetic Irritation of one Eye following injury of the other. By Dr. Dyer.

5. Sympathetic Ophthalmia, persisting after Enucleation. Removal of Extremity of Optic Nerve and surrounding Tissues. Recovery. By Dr. H. Derby.

In addition to case reported by Dr. Derby of exsection of the stump of the nerve, others were given by Dr. H. D. Noyes, Dr. Loring, and Dr. Althof. Dr. J. F. Noyes reported a case of detachment of the retina which excited sympathetic irritation of the other eye, and which was removed by enucleation.

6. Astigmatism produced by Tenotomy of Recti Muscles. Dr. H. D. Noyes.

The cause of the astigmatism was operations of tenotomy for muscular insufficiency. Dr. Mathewson reported a case of acquired astigmatism, caused by a tumor of the upper lid, which disappeared on removal of the tumor. Cases of acquired astigmatism not caused by any apparent lesion were given by Drs. Loring, Pomeroy, and Green. Dr. Webster recited a case produced by permitting an infant to suck upon the mother's closed eye, to make it go to sleep. Dr. Thomson gave a case which ensued from phlyctenular inflammation of the cornea.

7. Three Cases of Conical Cornea, corrected by suitable Glasses. By Dr. Thomson.

8. On the Atropine Treatment of Acquired and Progressive Myopia. With a Table of Cases. By Dr. H. Derby.

9. Case of Extreme Myopia. By Dr. H. D. Noyes.

10. Mydriasis treated by Electricity. By Dr. Webster.

Various members gave experiences of success, and want of success by galvanic treatment, using both kinds of currents.

11. Cases of Inflammation in the Orbit. By Dr. H. D. Noyes.

12. Visual Acuteness = $\frac{17}{8}$ to $\frac{47}{16}$. By Dr. Jeffries.

13. A new Modification of the Ophthalmoscope. By Dr. Loring.

14. Syphilitic Gumma in the Ciliary Body. By Dr. Loring.

15. On the Circulation of the Optic Nerve and Retina in Disease of the Spinal Cord and Membranes dependent upon Caries of the Vertebræ. By Dr. Bull.

The Committee on Membership reported to the Society, and recommended for election:

Dr. C. S. Merrill,	Albany, N. Y.
" Edwin W. Bartlett,	Milwaukee, Wis.
" Lewis S. Dixon,	Worcester, Mass.
" A. G. Sinclair,	Detroit, Mich.

All of these gentlemen were duly balloted for and elected.

The papers read were on motion referred to the Publishing Committee.

The thanks of the Society were returned to Dr. Samnel W. Francis, for his proposed entertainment, and the regret expressed that the time of final adjournment will prevent the enjoyment of his proffered hospitality. The Secretary was directed to make this communication to Dr. Francis. Adjourned to meet at 8 P. M.

July 16, 1874.

Society met at 8 P. M.

The President, Dr. Agnew, took the chair. Minutes of the morning session were read and approved.

The bulletin resumed:

16. On Color-Tests for Ametropia, based upon the Chromatic Aberration of the Eye. By Dr. Green.

17. Trephining the Cornea to remove a Foreign Body. By Dr. Agnew.

Dr. Noyes reported an unusual proceeding for removing a deeply seated foreign body.

18. A new method of treating Blepharospasm. By Dr. Mathewson.

19. Case of Congenital Lachrymal Fistula. By Dr. Agnew.

20. Exhibition of new instruments.

Dr. Murdoch showed a speculum and fixation forceps, and a knife for tenotomy of the muscles of the eye. Dr. Hay showed an instrument to facilitate the removal of a long piece of the optic nerve in enucleation.

Dr. H. D. Noyes showed a new form of lid-retractor, adapted to deeply set eyeballs; also a fixation forceps which is held by the speculum.

The Committee on Membership presented for election the name of Dr. Charles H. Williams, of Boston, who was duly elected.

They also recommended that the next meeting in 1875 be held at Newport, which was adopted.

The Treasurer proposed that the assessment for the coming year be ten dollars. Adopted.

Dr. H. W. Williams reported that the Treasurer in Berlin of the fund for erecting a monument to Von Graefe, Mr. Felix Mendelssohn, had acknowledged the receipt of a sum amounting to six hundred and forty dollars, subscribed mostly by members of this Society. Ordered to be entered on the minutes.

Dr. Williams also reported the receipt of a letter from Professor Hasner, of Prague, acknowledging the courtesy of the Society in sending him their Transactions.

Dr. Prout offered the following resolutions, which were adopted, viz.:

Resolved, 1st, That the numbers of the published Transactions of the Society for its first eight meetings be considered the first volume of Transactions.

2d. That the second volume shall commence with the proceedings of 1873, and that in the published proceedings of the current and of subsequent years, the numbers shall be called parts of each volume, and paged continuously until about seven hundred pages shall have been printed.

3d. That the Secretary, Dr. H. D. Noyes, be requested to prepare a preface for the first volume, which shall include a history of the inception and original organization of this society, and a notice of its first meeting; and an index which shall be printed and sent, with title-page for Volume 1, to each member.

4th. That the Secretary, when each volume is completed, be requested to prepare a title-page and index therefor, which shall be printed and sent to each member.

Adjourned to meet at 9 A. M.

NEWPORT, *July* 17, 9½ A. M.

The President, Dr. Agnew, took the chair. The minutes of the previous session read, and, with certain amendments, approved.

The President brought before the Society the subject of making preparations to receive the International Congress in 1876.

Dr. H. W. Williams moved that a committee of six be appointed by the chair to advise with the Committee appointed in London, and to report to this meeting such suggestions as they have to offer. The chair appointed Drs. Williams, Jeffries, H. Derby, Thomson, Green, Rider, and Murdoch.

Voted, That the Committee on New Members be instructed to name a committee to give a report at the next meeting on the Progress of Ophthalmology.

Voted, That this Committee on New Members also consider the matter of a change in the by-laws, altering the time of meeting of the Society from the third Thursday to the second Thursday of July.

The bulletin resumed:

21. Cases of Optic Neuritis and Illustrations. By Dr. NORRIS.

Discussion by Drs. Wadsworth and Noyes.

22. Canthoplasty: a Clinical Study. By Dr. ALTHOF.

Remarks by Drs. Pomeroy, Prout, and Agnew.

23. Sarcoma of the Choroid, with Specimen. By Dr. STEVENS.

24. Sarcoma of the Choroid; two Cases, with Specimens. By Dr. WADSWORTH.

25. Sarcoma of the Choroid, with Specimen. By Dr. JEFFRIES.

26. Case of Foreign Body in the Globe, with Specimen. By Dr. JEFFRIES.

Cases of Sarcoma were also verbally reported by Drs. Mathewson, Bull, Thomson, and Noyes, who were requested to hand them in writing to the Secretary for publication.

The Committee on Membership reported, as the Committee on the Progress of Ophthalmology, the names of Drs. H. D. Noyes and Wadsworth.

Dr. Noyes returned thanks for the honor, but would be unable to accept the duty. Dr. Wadsworth was then appointed.

The Committee also reported that the time of meeting be changed to the fourth Thursday of July.

On motion, adjourned for five minutes.

After a recess of five minutes, the Society called to order by the President. The minutes of the Session read and approved.

The proposed amendment to the by-laws as to time of meeting brought forward. Dr. Green proposed to substitute the second Thursday for the fourth Thursday, as recommended by the Committee. This proposition was lost.

The vote then taken on the proposition of the Committee, which resulted in thirteen in favor, and three against it. This vote being just one-half the total number present at this annual meeting, and not a majority, the vote was decided in the affirmative, by the casting vote of the President, viz., fourteen to three, the number in attendance at this meeting being twenty-six.

The Special Committee as to the International Congress presented their report, which was accepted, as follows:

The Committee respectfully report that they recommend that the Congress be held at Newport, R. I., rather than in any large city, for reasons as follows:

Newport is, as it were, neutral ground as regards the different sections of our country. All members in attendance will be at leisure in Newport to attend to our guests, while in a city the local delegation must be more or less engrossed with their private cases.

The success of our own meeting in Newport is an earnest of a similar greater success of the Congress, if held in Newport rather than in any large city.

The visits of our friends to the institutions of our cities can be better and more advantageously made by individuals or in small parties than in the crowd incident to visits in the interval of the sessions when held in a large city.

In Newport an elegant private hospitality may probably be invoked in behalf of our guests.

All our guests will necessarily visit our cities: the meeting at Newport will give a glimpse of another phase of American life.

The Committee express the hope that the members of this Society may receive our foreign visitors as our guests, taking

them under our charge from the time of their leaving New York until the end of the Congress.

A brief sketch of possible tours with cost, etc., and especially a directory of members of our Society, may greatly facilitate the movements of our guests, and add to the cordiality of their reception when journeying through the country.

The Committee also recommend the following as a Co-operative Committee to aid in carrying out more fully the hospitable wishes of the Society, omitting names of members from New York City who have already been designated by the New York Ophthalmological Society :

Dr.	H. W. Williams,	Boston, Mass.
"	G. Hay,	" "
"	B. J. Jeffries,	" "
"	Isaac Hays,	Philadelphia, Penn.
"	W. Thomson,	" "
"	W. F. Norris,	" "
"	George Strawbridge,	" "
"	J. S. Prout,	Brooklyn, N. Y.
"	Arthur Mathewson,	" "
"	G. T. Stevens,	Albany, "
"	C. S. Merrill,	" "
"	Edwin Hutchinson,	Utica, "
"	Charles E. Rider,	Rochester, "
"	Ezra Dyer,	Pittsburgh, Penn.
"	Russell Murdoch,	Baltimore, Md.
"	H. G. Miller,	Providence, R. I.
"	J. J. B. Vermyne,	New Bedford, Mass.
"	E. Williams,	Cincinnati, O.
"	Edward L. Holmes,	Chicago, Ill.
"	J. F. Noyes,	Detroit, Mich.
"	John Green,	St. Louis, Mo.
"	Edwin W. Bartlett,	Milwaukee, Wis.

Dr. Mathewson moved that the Secretary have printed an amended copy of the constitution and by-laws. Carried.

Dr. Mathewson also moved that the Secretary be instructed to have printed a list of members with their addresses in detail, to be sent to the members. Carried.

The bulletin resumed :

27. Operations for Entropium and Trichiasis according to Jaesche's method. Dr. Green.

28. A Contribution to the Statistics of Cataract Extraction of one hundred and eighteen recent Cases. Dr. Agnew.

29. Twenty-two Extractions of Cataract. Dr. Rider.

30. A new method of operating for Strabismus. Dr. J. F. Noyes.

Considerable discussion ensued upon this paper, which was verbally presented—the method being in reality a new process of advancement of a muscle.

The resolutions regarding the sending of papers to the Publishing Committee were reaffirmed—the time fixed for placing them in the hands of the Committee being September 15th.

The reproduction of Green's tables for testing Astigmatism was referred to the Publishing Committee, in connection with Dr. Green.

The Committee on New Members, etc., reported the nomination of the following officers for the ensuing year, viz.:

For President, Dr. C. R. Agnew, New York.

For Vice-President, Dr. G. Hay, Boston.

For Recording Secretary and Treasurer, Dr. Richard H. Derby, New York.

For Corresponding Secretary, Dr. H. Althof, New York.

For Publishing Committee, Dr. H. D. Noyes, Dr. E. G. Loring, New York.

The above officers were unanimously elected. Dr. Agnew returned thanks to the Society for the honor conferred upon him.

Dr. Williams moved that the thanks of the Society be offered to Dr. H. D. Noyes, for his assiduous labors as the Recording Secretary and Treasurer of the Society during the period of ten years, and the regret of the Society that he finds himself compelled to relinquish the position. Carried. And Dr. Noyes responded.

On motion, adjourned.

HENRY D. NOYES, M.D.,
Recording Secretary.

THE FOLLOWING MEMBERS WERE IN ATTENDANCE ON THE MEETING OF JULY, 1874.

Dr.	DAVID WEBSTER,	New York, N. Y.
"	ARTHUR MATHEWSON,	Brooklyn, "
"	J. F. NOYES,	Detroit, Mich.
"	E. DYER,	Pittsburgh, Penn.
"	O. F. WADSWORTH,	Boston, Mass.
"	C. S. BULL,	New York, N. Y.
"	H. W. WILLIAMS,	Boston, Mass.
"	H. ALTHOF,	New York, N. Y.
"	J. S. PROUT,	Brooklyn, "
"	O. D. POMEROY,	New York, "
"	JOHN GREEN,	St. Louis, Mo.
"	WM. THOMSON,	Philad'phia, Penn.
"	G. HAY,	Boston, Mass.
"	RUSSELL MURDOCH,	Baltimore, Md.
"	J. J. B. VERMYNE,	N. Bedford, Mass.
"	CHARLES E. RIDER,	Rochester, N. Y.
"	HENRY D. NOYES,	New York, "
"	C. R. AGNEW,	" "
"	HASKET DERBY,	Boston, Mass.
"	B. JOY JEFFRIES,	" "
"	RICHARD H. DERBY,	New York, N. Y.
"	EDWARD G. LORING, JR.,	" "
"	W. F. NORRIS,	Philad'phia, Penn.
"	GEORGE T. STEVENS,	Albany, N. Y.
"	F. J. BUMSTEAD,	New York, N. Y.
"	LEWIS S. DIXON,	Worcester, Mass.

ASTIGMATISM PRODUCED BY TENOTOMY OF RECTI MUSCLES. By Dr. Henry D. Noyes, New York.

Miss A. B., æt. 18, New York, came to me in June, 1867, for advice respecting her eyes. She had never worn glasses, notwithstanding she had myopia: in the right eye $-\frac{1}{18}$; in the left $-\frac{1}{24}$; in both V. $= \frac{20}{20}$. Her chief complaint was on account of double vision for distant objects. The diplopia corrected by a prism of 3°, with base outwards and horizontal. Sometimes her eyes become visibly crossed. Another examination, made three months later, modified the record of ametropia by the detection of a slight astigmatism in each eye, and the formula was written—

O. D. $-\frac{1}{20}$ s $-\frac{1}{48}$ c 65° V. $= \frac{20}{20}$.

O. S. $-\frac{1}{20}$ s $-\frac{1}{48}$ c 20° V. $= \frac{20}{20}$.

The diplopia is due to paresis of left rectus externus, and requires a correcting prism of 4° for distance. About six months later, the paresis had increased so much as to require a prism of 8°.

I made a tenotomy of the left rectus internus, which was done with such extreme care as to produce absolutely no effect upon the equilibrium of the muscles. About three weeks later, I made a tenotomy of both recti interni at the same sitting, and found the muscles large. The effect was to give on the following day crossed images for fifteen feet, which by a strong effort she could just overcome. In ten days there was correct single vision, from twelve feet to three inches in the median line, and at twelve feet an abductive power of 3°. In five weeks later additional improvement had taken place. Single vision was enjoyed at all distances on the median line, and also on the side toward the paretic muscle (the left), while an extreme move-

ment to the right elicited crossed diplopia. When the eyes were turned to the extreme limit on either temporal side, nystagmus would occur. It thus appeared that the tenotomies had been pushed to the bounds of safety, and the patient was able to use her eyes with comfort. During about two years the improvement continued; diplopia was entirely absent; there was no pain; the glasses served their purpose for distant vision. I congratulated myself upon a result so auspicious, and upon the accuracy which had been obtained in a kind of operation which will not always behave according to rules.

But the sequel remains. Miss C. made a visit to Europe in 1871, remaining about eighteen months, and just before her departure she found that some tendencies to the original variety of diplopia began to appear—*i. e.* paresis of the left externus. After being abroad for some time the trouble increased, and at length, under advice of Dr. D. in Switzerland, she submitted to another tenotomy of the left rectus internus. This was the third time that this muscle had been attacked. The details of the operation and the amount of effect produced, I do not know; but on her return home there was crossed diplopia, which required at fifteen inches a prism of 6° base inwards. That is, there was insufficiency of the rectus internus, and also of the rectus externus of the left eye. The annoyances of this condition were much more acutely felt than were those which she before endured. It was impossible to use her eyes upon near work, and to use her glasses for distance made her uncomfortable, because she was not quite able to secure single vision.

Examination showed the following to be the state of the eye, in June, 1872:

O. D. — $\frac{1}{16}$ s — $\frac{1}{36}$ c 10° V. = $\frac{20}{20}$.
O. S. — $\frac{1}{36}$ s — $\frac{1}{15}$ c 20° V. = $\frac{20}{20}$.

At sixteen inches there is an insufficiency of adduction with a prism base upwards of 15°; at fifteen feet with a prism base upwards, there is insufficiency of abduction of 20°. It will be noted that the optical conditions have already decidedly changed. In the right eye myopia has advanced, both in the spherical and cylindrical sense, to a slight degree; while in the left and much operated eye, the spherical error has diminished from $\frac{1}{20}$ to $\frac{1}{36}$ and the cylindrical error been augmented from $\frac{1}{48}$ to $\frac{1}{15}$. A

diminution in spherical error of $\frac{1}{4\,5}$, and an addition to the cylindrical error of $\frac{1}{2\,5}$. I prescribed for reading a pair of prismatico-cylindric glasses, which gave great comfort.

In March, 1874, the following data were obtained :—In viewing a candle at twenty feet with correcting glasses, the amount of adduction = 9°, of abduction = 6° ; with a prism before one eye vertically there was 2° of divergence. In looking at a candle at twenty feet, without correcting glasses, the amount of abduction was 15°, and when vertical diplopia was produced, there was divergence of 10°.

At the distance of fourteen inches, with vertical diplopia, there was deficiency of adduction of 7°.

The refractive condition was as follows :

O. D. — 16 s — 20 c 180° V. = $\frac{2\,0}{2\,0}$.

O. S. — 36 s — 12 c 175° V. = $\frac{2\,0}{2\,0}$.

It is thus seen that a muscular condition in which there was at the first defective abduction for distance of 8°, became converted into defective adduction by the repeated tenotomies. The degree of deficiency cannot perhaps be expressed in figures accurately, but the ratio of 9° adduction to 6° abduction for distance is wholly inadequate to comfort ; while a ratio of 18° to 6° or 3 : 1 is much nearer to the average normal condition. The loss of adductive power may therefore be set down as from 17° to 20°.

The influence upon the refraction was most evident in the eye which was submitted to the greatest number of operations, viz., the left. Of course allowance may be fairly made for the natural tendency to increase of myopia in six years, but this has not been great. The right eye shows only an increase from $\frac{1}{2\,0}$ *s* to $\frac{1}{1\,6}$ *s*, and of astigmatism from $\frac{1}{4\,5}$ *c* to $\frac{1}{2\,0}$ *c*, but with a change of axis from 65° to 180°.

The left eye shows a diminution of spherical error from $\frac{1}{2\,0}$ *s* to $\frac{1}{3\,6}$ *s*, and increase of astigmatism from $\frac{1}{4\,5}$ *c* to $\frac{1}{1\,2}$ *c*, accompanied by a change of axis from 20° to 175°.

It appears, therefore, that the myopia which at its maximum in the left eye amounted to $\frac{1}{1\,5}$ in the meridian of 20°, was increased by the operations to an error of $\frac{1}{9}$, and the position of the maximum meridian of curve underwent a rotation of 25°.

While the increase of optical error was not attended by any

special disadvantages to the patient, inasmuch as it was capable of perfect correction, the case in my judgment throws light on the etiology of astigmatism. I would also call attention to the very common association which is found to exist between myopic astigmatism and muscular insufficiency; and although astigmatism is commonly regarded as a congenital error of the eye, ought we not to set down a certain number of cases as the result of defective muscular equilibrium?

THREE CASES OF CONICAL CORNEA CORRECTED BY SUITABLE GLASSES. By Wm. Thomson, M.D., of Philadelphia.

These cases might more accurately be classified under the head of acquired astigmatism, since their histories demonstrate that the optical defects were induced in eyes that were probably emmetropic, by prolonged strain of the eyes in reading with insufficient illumination, when the individuals were rendered vulnerable by causes which produced a general debility of their systems. On inspection, the first presented slight evidence of the conical condition, the second was more marked,—whilst the third would be recognized at once as a characteristic case of conical cornea, with sight so imperfect that the patient, who had been using — $\frac{1}{24}$ spherical for several years, could only read at his far point, with his glass, viz., six inches, type of a large size; and whose correction would have been considered by me impossible by glasses but for the experience obtained from the study of the preceding ones. The high degree of acuity of vision, and the increased working power and comfort which has been gained by the correction in these cases, would encourage me to persevere in the analysis of any future ones that might present themselves, before proceeding to any operation; although it would be impossible in the limits of this paper to give a true picture of the difficulties encountered in the hours of prolonged and wearisome examination into the refraction of these eyes.

Mrs. W., age forty-eight, in good health, states that her distant sight was perfect until she was twenty-five years of age, when, after the birth of a child, she was confined to bed for

many weeks by a prolonged illness, and amused herself by reading in a dimly-lighted room. She found when she recovered her health that her sight was imperfect. No change has since taken place, her eyes present no sign of disease, her distant sight is imperfect, but she can read at nine inches by nipping her lids together into a stenopäic slit, although the prolonged use of her eyes in this way gives her severe headache: with either eye alone V.$=\frac{1}{10}$; with both together V.$=\frac{1}{5}$; with both she reads 3 Snellen at ten inches, but with either alone the far point is five inches. No spherical glasses materially assist, and this anomaly is accounted for, after hours of examination, by the diagnosis of mixed astigmatism in either eye, at such angles as to enable one eye to partially compensate for the defect in the other. In the R. E. she has hypermetropia for line at 30°, and myopia for 120°, whilst in L. E. there is myopia for 30°, and hypermetropia for 120°, so that she sees the two parts of a circle, or other object, in these angles best with both eyes together, imperfectly with either alone, by the binocular fusion of the two indistinct images. She has a binocular far point of 10 inches, and a monocular one of 5 inches, which also results from the degree of defect, which is hy. $\frac{1}{10}$ combined with m. $\frac{1}{10}$ in either eye, which enables her to read with both eyes at 10 inches with suppressed accommodation, but which develops an apparent myopia of $\frac{1}{5}$ when she uses the accommodation to assist the hypermetropic meridian in either eye when it is employed alone.

The reflex of the window from the cornea was small in size at its centre in comparison with that from the periphery. With the ophthalmoscope in the upright method the refraction of parts of the periphery of the cornea was hypermetropic, whilst the centre was myopic; and whilst the astigmatism was of course readily perceived by this means, its degree was very difficult to determine.

That there was slight conical cornea was shown by the difficulty in the use of all the usual means of diagnosis, including the stenopäic slit with test letters, the test lines of Greene, and my method with the two perforations in a screen combined with spherical and cylindrical glasses, and the use of the ophthalmoscope in the upright method. As the result with

atropia, the following formula gave the highest acuity of vision:

Rt. $+\frac{1}{10}$ cy ax. 30° ⌒ $-\frac{1}{10}$ cy ax. 120°.
Lt. $+\frac{1}{10}$ cy ax. 120° ⌒ $-\frac{1}{10}$ cy ax. 30°.

which increased V. from $\frac{10}{c}$ to $\frac{10}{xvi}$.

Case 2. M. P., age thirty-eight: seen first, December, 1870. Until eighteen years of age had perfect sight for distance, since he was a surveyor and could see the signals at half a mile distant. He then changed his occupation for that of a conveyancer, and in addition to his daily duties attempted to study law, by a poor light at night, keeping himself awake by walking the floor with his book in his hand. His general health broke down, and he then found his distant sight very imperfect, but improved by concave glasses.

Two years previously he had been examined and provided with a $-\frac{1}{5}$ sph. on the Right, and $-\frac{1}{9}$ s ⌒ $\frac{1}{18}$ cy on Left, which gave but little satisfaction for distant vision, and is interesting as showing the opinion of a clever surgeon. It was found that in the Left these glasses gave an induced hypermetropia $= \frac{1}{14}$, and a yet greater defect in the Right. Inspection, and the ophthalmoscope, revealed marked conical cornea, whilst the most patient efforts with test objects, spherical and cylindrical glasses, and stenopäic slits, with paralyzed accommodation, were needed to obtain a diagnosis. By the upright method it was found that the periphery of the cornea at some parts was hypermetropic, whilst the centre was highly myopic; and after hours of effort the following result was obtained:

Rt. $+\frac{1}{30}$ s. ⌒ — $\frac{1}{7}$ cy., axis 50°, V. $= \frac{20}{LX} = \frac{1}{2}$.
Lt. $-\frac{1}{24}$ s. ⌒ $-\frac{1}{15}$ cy., axis 115°, V. $= \frac{20}{XXX} = \frac{1}{2+}$.

On the right this was a compromise, and was attended by a singular double vision, arising from the uncorrectable apex of the cone. When he regarded a gaslight, for example, there was at the side and below the sharp image a second large, indistinct blur of light. It was found that this second image could be sharpened in definition by a $-\frac{1}{5}$, at the expense, however, of the first and best one. The ghost of the main object was far enough away, and vague enough to interfere but little with the appearance of the true light, and the patient soon became indifferent to its presence. I have not seen this per-

son for three years, but I have recently been informed that he uses his correction with entire satisfaction. The etiology of this case is not less interesting than its correction with glasses.

Case 3. D. M. P., age forty-two:

When a boy, he could tell the time of the clock on a distant tower, and had perfect distant vision until sixteen years of age, when he went as clerk into a store, and for some months read from badly printed books for hours late into the night, by a very poor light. His sight became imperfect, and his general health also became impaired. At twenty he was using the glasses which he wore when first examined by me: on the Rt. $-\frac{1}{24}$ which gives for distance V. $\frac{10}{cc} = \frac{1}{20}$, but with which he is able to read at six inches from the eye; on Lt. $-\frac{1}{4}$, which gives so little aid that he uses the right for all purposes.

The reflex from the cornea, very small at centre, and rapidly increasing in size at the periphery, the deep anterior chamber, and the marked cone on lateral inspection left no doubt as to the diagnosis. This was confirmed by the play of light from the apex of the cone with the ophthalmoscope, and by finding the inverted image of the retinal vessels visible about 1 inch in front of the cornea; he could read large print at three inches, and with $-\frac{1}{24}$ s. at 6 inches, which was then his far point. With paralyzed accommodation and dilated pupil, the most contradictory results were obtained by stenopäic slits and circles. A circular opening of 1 mm. for example, and $-\frac{1}{2}$ s. gave V. $\frac{10}{xxx}$ at the conical centre, but nowhere else. With my test of double perforations, and one covered with crimson glass, the double light point would indicate either myopic or hypermetropic refraction as the patient moved his head, nor was it possible to ascertain by this method any more than the refraction of two peripheral points of a conical cornea. A stenopäic slit with spherical glasses was likewise unavailing, since it included in its analysis peripheral and central corneal portions; and for the same reason the radiating astigmatic lines of Greene only served to put the patient and the observer farther apart in their efforts to extract some truth from the conflicting experiences.

The upright examination with ophthalmoscope gave the most

precise preliminary knowledge, and enabled the surgeon to at least form some definite idea of the refraction; the apex of the cone demanded the highest concave glasses, whilst there were parts of the periphery of the cornea through which retinal vessels were seen with convex ones; one fixed point after the other was thus obtained, the patient's power of definite statement being gradually cultivated until the following result was reached, giving hypermetropia and myopia combined, and affording in Right V. $= \frac{20}{XXX}$ with $+\frac{1}{10}$ cy., ax. 180°, $\bigcirc -\frac{1}{6}$ cy., s., ax. 90°.

With the Left, the far point was $2\frac{1}{2}$ inches, and a $-\frac{1}{24}$ s gave V. $\frac{10}{C}$; the appearances were the same as in the right, but there was greater distortion in light points and other test objects. With the ophthalmoscope in the upright method, I found when he wore his $-\frac{1}{24}$ s, that the horizontal retinal vessels were seen above it, avoiding its use, with $+\frac{1}{12}$, and through it the vertical vessels were seen with $+\frac{1}{8}$, and after wearisome examinations with the ophthalmoscope, and every other possible method, the best correction was obtained with the following remarkable combination: $-\frac{1}{36}$ cyld., axis 90° $\bigcirc +\frac{1}{16}$ cyld., axis 180° V. $= \frac{20}{XL}$.

These glasses were constructed and properly mounted, and after the accommodation had returned, he had no insufficiency, there was binocular vision, he had an $A = \frac{1}{4}$, and could read with either eye $1\frac{1}{2}$ S at 12 inches fluently.

With either eye there was a ghost of the object regarded, which was dimly seen some distance below the real one. When he looked through his correction at a circle of light one-half inch in diameter, at twenty feet distant, it was clearly perceived, but below it there was seen a pear-shaped, hazy spectre of the same light, with its long axis perpendicular, and commencing just below the true light, and seeming to be six inches in length by two and one-half in width. The double vision was tested also by a disc of blue paper for an object, which was sharply defined, and recognized at twenty feet, whilst below it the patient observed a hazy, much larger, and ill-defined blue image of the disc.

From the study of this case and the one previously related, it would appear that by patient experimentation it might be

possible to correct the greater portion of a misshapen conical cornea, and to overpower by the brilliancy of its definition the remaining uncorrectable apex of the cone. This theory has been fairly successful in practice in these two instances; and either by the skilful arrangement of his head, or by happy accident, each patient can receive the sharp images of objects, through his glasses, on the macula, whilst the hazy images from the small corneal apex fall above it on a less sensitive portion of his retina.

Dr. Norris, who saw case 3d after the correction, pointed out to me that the axis of the cone was directed downwards. I found that the double images, below the true ones, could be obliterated, and vision a little improved, by lifting upwards, to the horizontal line in front of the eye, a screen, or other opaque body, thus cutting off the light that would pass through the lower portion of the cornea.

It is worthy of remark that in this last case, with such high degree of myopia, and the use for years of glasses so unsuited, there was not the slightest appearance of a crescent at the optic disc, posterior staphyloma, or choroiditis in either eye; and this could be definitely ascertained by observing the fundus through his correction, by either the erect or inverted method of using the ophthalmoscope.

NOTE.—Whilst revising the proofs of these histories, a fourth case has been treated, which will be briefly described.

M. W., aged 35, in 1861 had a tumor removed from upper lid of left eye; and in 1869 she used the eyes for hours at night, whilst nursing a sick relative, in reading and writing by a dim light. She now suffers from headache on the near use of the eyes for half an hour, which continues for hours afterwards.

There is Hy. of $\frac{1}{10}$ in right, with V. $\frac{1}{4}$. In left, V. $= \frac{10}{cc}$, not improved by + or — spherical glasses.

With the accommodation paralyzed, the V. in left is reduced for distance, but she can read at 3″, No. 2, Snellen, proving the existence of myopic refraction. By the ophthalmoscope aërial images of the retinal vessels are seen a short distance in front of a limited portion of the cornea, and by the erect image the refraction is there found myopic, whilst above this point convex glasses are needed to see vessels which pass from north-east to south-west; a careful examination with lines and letters gave proof of Hy. astigmatism and a $+ \frac{1}{10}$ cy., ax. at 10° gave V. $= \frac{20}{\frac{1}{2}xx}$.

With no glass a point of light is a streak, but with $\frac{1}{10}$ cy. it becomes a point,

but there extends from it downwards a luminous haze, which at 20 feet is 6 inches long by 3 wide, pear-shaped and having a point of brightness at its lower extremity; this can be entirely cut off by placing a card over the lower half of the cornea.

After the atropia had passed away, and the accommodation had returned, she could read No. 2 fluently at 12 inches with the cylinder, or at 3″ without it, which she did by using, in the latter experiment, the conical part of the cornea.

ON THE ATROPINE TREATMENT OF ACQUIRED AND PROGRESSIVE MYOPIA. With a Table of Cases. By Hasket Derby, M.D.

The recent therapeutics of progressive and of acquired myopia have received but moderate attention from English writers on ophthalmology. Accepting apparently the dictum of Donders, that the cure of this error of refraction belongs to the class of things "devoutly to be wished for" with unquestioning faith, they have contented themselves with discussing the division of the external recti, in cases where weakness of the interni is found, and in going into the general question of prophylactics. The investigations that have been going on, especially in St. Petersburg and Basle, within the past six years, have attracted very little attention elsewhere, judging at least from current ophthalmic literature. It is therefore with less diffidence that I present a few results of my own, and, having nothing original as regards method to bring before the Society, briefly direct its attention to some departures from the received doctrines on this subject which a few years have inaugurated. Though few in number, they are by no means unimportant.

Speaking of the pain in and fatigue of the eyes experienced by many myopic persons during work on near objects, Donders observes in his classical work on the subject: "In the higher grades of myopia, a species of spasm of the accommodation is not unfrequently associated with this irritable condition, and an even increased degree of myopia is found, which disappears, however, as the irritability diminishes; especially after the abstraction of blood by means of the Heurteloup leech, and after a prolonged seclusion in the dark. Professor Junge, of

St. Petersburg, has called my attention to this fact, and I have found a confirmation of it in several cases."

It will be seen from the above that our illustrious master is inclined to limit the accommodative spasm to the higher grades of myopia, and hence considers its occurrence as comparatively infrequent. It is also to be inferred that he regards the spasm as dependent on the irritability, and as disappearing on its removal.

Different results have, however, been arrived at by a follower of Professor Junge, who undertook the investigation of this subject at his suggestion, and in 1868 published his labors in a supplement to the "Klinische Monatsblätter für Augenheilkunde." With the work of Dobrowolsky you are doubtless familiar, but a resumé of his opinions seems hardly out of place in this connection.

He found the complication of myopia with accommodative spasm to be much more frequent than had previously been supposed—observing it 69 times in 105 cases. It was met with in all grades, yet more frequently with the lower than the higher. It was found to occur with emmetropia and counterfeit myopia.

According to him, myopes, being under all circumstances unable to see distant objects distinctly, are less tempted to relax their accommodation for the far than emmetropes. The ciliary muscle is thus apt to remain in a state of constant tension. This spasmodic contraction yields slowly to atropine. One or two applications, even though made in substance, are not sufficient to cause complete relaxation, and the accommodation lets up little by little, and in a varying degree—the process often occupying several days. Where the intraocular pressure is heightened, the effect of the atropine is least, and increases as the former is diminished.

Dobrowolsky found the symptoms of irritation to depend on the cramp of the accommodation, and not, according to Donders, to act as its cause.

The increase or diminution in the myopia was also found to depend on the degree of congestion of the vessels of the intraocular tunics; local depletion directly diminishing the myopia by bringing about a lessened intraocular pressure, and hence a shortening of the visual axis.

While admitting, with Donders and Stellwag, the influence of hereditary predisposition, as well as congenital myopia, he found a distinct class of cases where undue exercise of the accommodation caused atrophic changes around the optic entrance, and consequent lengthening of the visual axis in the normal, and even in the hypermetropic eye. He found the latter developing staphyloma posticum, becoming emmetropic and even myopic.

The therapeutics employed by Dobrowolsky were the application of atropine, often in substance, and the use of the artificial leech on the temple. The latter he found to lessen the hyperemia resulting from the accommodative spasm; the former to diminish both. With reference to the acuteness of vision, he found this to increase in proportion as the capillary hyperemia of the optic entrance, the congestion, tortuousness, and number of the visible vessels were diminished. Atropine, by bringing this about, often added to the acuteness of vision, even where it did not diminish the refraction.

This is an exceedingly brief and imperfect resumé of the labors of Dobrowolsky. In 1871, Dr. Hosch, of Basle, a scholar of Professor Schiess Gemuseus, and in 1872 the Professor himself published short dissertations, the former on "The Therapeutical Effects of Atropine on Myopic Eyes," the latter on "The Therapeutics of Myopia." The pamphlet of Schiess is accompanied by a tabular statement of fifty-three cases, embracing the twenty-nine reported by his pupil.

To Professor Schiess belongs the credit of utilizing the researches of Dobrowolsky for ophthalmic practice. So long, he justly observes, as myopia was considered largely hereditary and entirely incurable, the ophthalmic surgeon contented himself with giving suitable cautions, and prescribing, in general terms, a course of dietetics calculated to arrest the progress of the trouble he had no hope of ameliorating. But with the knowledge that the affection commenced in many cases with an accommodative spasm, antedating the organic change, and with the certainty that it was often acquired during school years or in early life by individuals manifesting no hereditary predisposition, born emmetropic and even hypermetropic, to a much greater extent than had ever been imagined, came the

idea of probable arrest and possible diminution, and even cure.

Cases of acquired myopia were recognized by Schiess from the outset as those most adapted for treatment, the more recent being naturally the more favorable. He lays down the axiom that the longer the myopia has lasted, and the higher the degree it has acquired, the less is the proportion of spasm, and the greater that of lengthening of the axis, met with.

Withdrawing his patients from all use of the eyes on near objects, and arming them with protective glasses, he ordered twice daily the application of a solution of one part of atropine to 120 of water, and kept this up ordinarily for three or four weeks. The first result was taken after all the immediate effect of the atropine had subsided; and, for the purpose of estimating the ultimate effect, a second measurement was made as much later as possible—sometimes after one, sometimes after nine, months.

One hundred and one eyes were thus treated. The result was a conviction that atropine was capable of bringing about a permanent improvement in a very large number of cases of myopia, and of causing the complete disappearance of this error of refraction in certain cases where it was but slightly developed.

Spasm of accommodation was met with in a little over 85 per cent. of the cases treated.

Of 101 eyes 20 showed no myopia after atropinization.
66 " less " " "
in 15 myopia was unaltered or progressive.

In 69 per cent. there was definite improvement.
" 20 " " myopia was arrested.
" 9 " " myopia progressed.

I have made no special analysis of the results of Hosch, inasmuch as all his cases are embraced in the list just referred to. It should be noted that in the outset many cases of advanced myopia were treated, while later the atropine cure was only employed in the commencement of this affection. Had this

course been followed throughout, the results would have been even more favorable.

I present herewith a series of tables, drawn up on the plan of Professor Schiess, giving an analysis of the condition and results in sixty-seven eyes treated by me in this manner. These tables will readily explain themselves. Separate columns are left for the acuteness of vision, original myopia, immediate result (commonly estimated several days after the last application of atropine), and ultimate result as recorded at the last interview, as much later as possible—the interval between the two examinations being always given. These cases were all taken from my record-books, and some had been under observation a number of years. Under the head of "Remarks" I have stated any interesting points I could find in the history or progress of the case.

To a few of these cases I would call particular attention. Case No. 3 particularly interested me, from the manner in which the true state of the refraction came to be discovered. Patient, a schoolboy æt. twelve, had My. $\frac{1}{16}$ in February, 1866. In December of the same year it had increased to $\frac{1}{14}$. In March, 1867, there being much pain on use, I advised him to commence reading five minutes three times a day, increasing half a minute daily, and ordered him for this purpose $-\frac{1}{36}$ slightly tinted blue. April 27th there was still much local pain and intolerance of light, as well as blur on use. On examining his glasses, I found that the optician had given him, by mistake, *convex* $\frac{1}{36}$ instead of concave, and that his efforts to read with this glass had brought to light the true state of the refraction. An examination now showed Hm. $\frac{1}{36}$ and Ht. $\frac{1}{18}$. Pagenstecher reports * a case of chronic catarrh in a man 43 years of age, who had for three years worn what he bought for a plane, blue, protective glass. Up to the time of his putting it on, his vision had seemed normal. At first he had been unable to see distant objects as well, but after wearing the glass a time he grew accustomed to it, saw as well as ever, and was ultimately unable to get along without it. The glass proved to be convex $\frac{1}{12}$, given by a mistake of the optician for plane.

* Klin. Beob. aus der Augenheilanstalt zu Wiesbaden. Erstes Heft., S. 62.

I cannot agree with Pagenstecher that this was a case of acquired hypermetropia, but think that here, as in my own case referred to, the true refraction was brought to the surface by the accidental use of a partially neutralizing glass. If this is true, may it not be possible to overcome accommodative spasm by the use of appropriate convex glasses, and thus escape the loss of time incident to a prolonged course of atropine?

Case 9 was remarkable for the readiness with which the accommodative spasm yielded. The My. was $\frac{1}{20}$. Solid atropine was applied, and within 24 hours there was Hm. $\frac{1}{15}$. Thirteen days later there was Ht. $\frac{1}{8}$, showing a cramp of $\frac{1}{7}$. The largest cramp relieved by Schiess was one of $\frac{1}{13}$. In Liebreich's well known case, My $\frac{1}{40}$. was converted by atropine into H. $\frac{1}{24}$, a cramp of $\frac{1}{15}$. So far as I have been able to follow the literature of the subject, the present is one of the largest degrees of cramp on record. The readiness with which it yielded to atropine was quite exceptional.

Case 30 shows My. $\frac{1}{20}$ turning into Ht. $\frac{1}{36}$ in the right eye, My. $\frac{1}{36}$ into Ht. $\frac{1}{36}$ in the left. On recommencing study, the right eye developed My. $\frac{1}{12}$; left, $\frac{1}{8}$. A weak convex glass being ordered for work on near objects, My. descended to $\frac{1}{60}$ in each eye. Contrary to orders, the glass was thrown aside, and the My. returned, as recorded, to $\frac{1}{48}$.

Case 32 shows a remarkable amount of spasm, which, unlike Case 9, yielded slowly and gradually to the influence of the mydriatic. December 13th, 1873, there was My. $\frac{1}{36}$ in each eye. 1874, January 9th, My. $\frac{1}{24}$, though all work had been refrained from during the interval. Commencing with January 12th, a solution of atropine (gr. os to ℥ j) was applied twice daily. 15th, Hm. $\frac{1}{36}$; 17th, Hm. $\frac{1}{18}$; 21st, Hm. $\frac{1}{14}$; 27th, Hm. $\frac{1}{13}$; 30th, the same; February 4th, Ht. $\frac{1}{11}$.

Finally, Case 14 exhibits the consequences resulting from persistent abuse of the eyes. E. G., æt. 12, the child of emmetropic parents, with no hereditary tendencies to near-sight, was examined by me in May, 1871, on account of pain and intolerance of light, brought on apparently by reading in the cars. My. $\frac{1}{12}$ was then found in each eye; no trace of posterior staphyloma was in existence. In November, 1872, she noticed that distant objects were growing less distinct, and there was

then found: right, My. $\frac{1}{20}$; left, My. $\frac{1}{36}$. Says that "on some days she can see more clearly than on others. On regarding distant objects intently they appear at first blurred, then suddenly grow distinct." Commencing staphyloma posticum is now plainly visible in each eye. Atropine was applied twice daily for six weeks, at the end of which time My. was $\frac{1}{36}$ right, $\frac{1}{72}$ left. Patient now went back to school, and, being both studious and ambitious, was soon absorbed in her work. 1874, June 6th, My. right, $\frac{1}{15}$, left, $\frac{1}{16}$, each staphyloma growing larger, much congestion of optic entrance and retinal vessels.

On summing up my results I find:

In 89.5 per cent. spasm of accommodation.
Of 67 eyes, 15 showed no myopia after atropine.
45 showed less myopia after atropine.
In 7 myopia was unaltered or progressive.
In 55.2 per cent. there was definite improvement.
In 8.9 per cent. myopia was arrested.
In 10.4 per cent. myopia progressed.
In 13 cases (21.3 per cent.) no subsequent information has yet come to hand.

The whole subject, in fine, needs and deserves further investigation and the collection of much more numerous statistics. As far as our present experience reaches, the following conclusions seem to me, as to others, justifiable.

That the emmetropic eye, through undue or disadvantageous use, acquires myopia much more frequently than has previously been supposed, and that such acquired myopia is very apt to be progressive, commencing with spasm of accommodation and going on, through a state of congestion and irritation, to the structural change characteristic of this error of refraction.

That the paralysis of the accommodation by means of atropine, persisted in during a period of several weeks, and furthered by rest of the eyes, shaded glasses, and, in extremely aggravated cases, by local blood-letting, offers a reasonable prospect of preventing the progress of the myopia, in some instances of lessening its amount, and, in occasional recent and slight cases, of removing it altogether.

That in cases of progressive myopia it is reasonable to expect positive results from an annual course of treatment similar to the above, carried on during those years which experience has shown to be most favorable to the advance of the myopia, thus enabling the patient to tide over a critical period. It is perhaps in its prophylactic action that the most importance is to be attributed to the atropine treatment.

No.	NAME.		REMARKS.
1	Mr. H.	R	all myopic till within a few weeks. through difficulty experienced in
		L	
2	Miss P.	R	of this eye was rapidly increasing, en only 1-20 in January, 1866. In eye M 1-14 stationary.
3	Master C.	R	was first seen in February, 1866. ia was then 1-16. In December of year it was 1-14.
		L	
4	Mr. F.		kamined together. Small staphy- t. in each.
5	Mr. G.	R	light scleral atrophy about each rance. The progress of the myopia t first brought to a standstill. Up ommencement of the treatment, in 1870, it had steadily increased, een only 1-6½ in October, 1866.
		L	

NAME.	Age.	Acuteness of Vision.	Original Myopia.	Treated by Atropine.	Immediate Result.	Primary Improvement.	Interval between Treatment and Second Examination.	Refraction then Found.	Final Improvement	REMARKS.
Mr. H.										
R.	47	$\frac{20}{20}$	$\frac{1}{400}$	90 days	E	$\frac{1}{600}$	9 years	M $\frac{1}{2}$	$\frac{1}{}$	Never at all myopic till within a few weeks. Noticed it through heavy exercise in shooting.
L.		$\frac{20}{}$	$\frac{1}{3}$	76 days	E	$\frac{1}{600}$	9 years	E		
Miss P.										
R.	20	$\frac{20}{}$	$\frac{1}{2}$	56 days	M $\frac{1}{10}$	$\frac{1}{24}$	8 years	M $\frac{1}{2}$	$\frac{1}{}$	Myopia of this eye was first discovered in having been only 1 month [illegible]. In the [illegible] M 1 [illegible]
Master C.										
R.	12	$\frac{20}{}$	$\frac{1}{4}$	15 days	Hm $\frac{1}{12}$	$\frac{1}{72}$	6 years	Hm $\frac{1}{24}$	$\frac{1}{}$	Patient was first seen [illegible] 1866. He was [illegible] In [illegible] the same year [illegible]
L.		$\frac{20}{}$	$\frac{1}{14}$	15 days	Hm $\frac{1}{12}$	$\frac{1}{72}$	6 years	Hm $\frac{1}{}$	$\frac{1}{}$	
Mr. F.	18	$\frac{20}{}$	$\frac{1}{2}$	17 days	M $\frac{1}{7}$	$\frac{1}{}$	4 months	M $\frac{1}{8}$	$\frac{1}{56}$	[illegible] loma post. in each.
Mr. G.										
R.	17	$\frac{20}{}$	$\frac{1}{12}$	32 days	M $\frac{1}{12}$	0	5 years	M $\frac{1}{4}$	Progress	Very [illegible] to the commencement of the treatment, in [illegible]
L.		$\frac{20}{}$	$\frac{1}{8}$	32 days	M $\frac{1}{8}$	0	5 years	M $\frac{1}{4}$	"	

No.	NAME.	REMARKS.
6	Mr H.	1867, M was 1-16. Treatment com- March, 1869. Small posterior a.
7	Mr. S. R	nt left town after ten days' treat- e myopia, in this case, supervened k of typhoid fever. The patient was n, and had previously been an ex- t. During his sickness he hardly yes at all. The first day he went ced his inability to see the hands t clock which he had always been t of consulting.
	L	
8	Mr. C. R	ad been rapidly increasing. Ret- s were found to be very large, and congested.
	L	
9	Mary L. R	d vision till an attack of scarlet weeks before. Since then had bad s; intolerance of light and myopia.
	L	
0	Mr. F. R	insufficiency of the recti-interni, an operation was proposed. The roved under treatment to 20-30 20-20 left. Myopia subsequently . (See No. 28.)
	L	

NAME.		Age	Acuteness of Vision.	Original Myopia.	Treated by Atropine	Immediate Result.	Primary Improvement.	Interval between Treatment and Second Examination.	Refraction then Found	Final Improvement.	REMARKS.
Mr H		16	[illegible]	[illegible]	35 days	M [illegible]	[illegible]	3 years	M [illegible]	[illegible]	In June, 1867 M was 1/16. Treatment commenced in March, 186[illegible]. Small posterior staphyloma.
M[illegible]	R	20	[illegible]	[illegible]	10 days	M [illegible]	[illegible]	2 years	M [illegible]	Progress	The patient left town after [illegible] days treatment. The myopia in the [illegible] [illegible] [illegible] [illegible] The patient was [illegible] and had previously been an ex[illegible] [illegible] During [illegible] [illegible] hardly used his eyes at [illegible] The first day he went [illegible] [illegible] the [illegible] [illegible] the habits [illegible] which he had always been in the habit of [illegible]
	L		[illegible]	[illegible]	10 days	M [illegible]	[illegible]	2 years	M [illegible]	Progress	
M[illegible]	R	16	[illegible]	[illegible]	11 days	M [illegible]	[illegible]	8 months	M [illegible]	0	Myopia had been rapidly increasing. Retinal vessels were found to be very large, and apparently congested.
	L		[illegible]	[illegible]	11 days	M [illegible]	[illegible]	8 months	M [illegible]	[illegible]	
M[illegible]	R	[illegible]	[illegible]	[illegible]	13 days	Ht [illegible]	[illegible]	3 months	Hm [illegible]	[illegible]	Had good vision till an attack of scarlet fever six weeks before. Since then had bad [illegible] [illegible] [illegible] and myopia.
	L		[illegible]	[illegible]	13 days	Ht [illegible]	[illegible]	3 months	Hm	[illegible]	
M[illegible]	R	[illegible]	[illegible]	[illegible]	30 days	M [illegible]	[illegible]	5 months	M [illegible]	[illegible]	M[illegible] insufficiency of the recti interni, [illegible] [illegible] [illegible] proposed. The [illegible] [illegible] under treatment to 20/30 [illegible] [illegible] Myopia subsequently progressed. See No. 28.
	L		[illegible]	[illegible]	30 days	M [illegible]	[illegible]	5 months	M [illegible]	Progress	

No.	NAME.	S.	
11	Miss F.	R	each eye. Com- aker" than before slightly increased inability to use a of the right eye
		L	years.
12	Mr. C.	R	s preceding treat- reased from 1-10 of retinal vessels
		L	
13	Ellen A.	R	reatment the my- in either eye. n each eye, larger
		L	
14	Edith G.	R	e was in each eye etropic. Engross- immediately after
		L	
15	Miss R.	R	ency 2° for near.
		L	

NAME	Age	Acuteness of Vision.	Original Myopia	Treated by Atropine	Immediate Result.	Primary Improvement.	Interval between Treatment and Second Examination	Refraction then Found.	Final Improvement	REMARKS.
M... I.	[illegible]	[illegible]	[illegible]	6 weeks	M [illegible]	[illegible]	[illegible] months	M [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	6 weeks	M [illegible]	[illegible]	[illegible] months	M [illegible]	[illegible]	[illegible]
Mr. C.	18	[illegible]	[illegible]	6 weeks	M [illegible]	[illegible]	[illegible] months	M [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	6 weeks	M [illegible]	[illegible]	[illegible] months	M [illegible]	[illegible]	[illegible]
Ellen A.	11	[illegible]	[illegible]	[illegible]	M [illegible]	[illegible]	[illegible]	M [illegible]	Progress	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M [illegible]	$\frac{1}{10}$	4 months	M [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	42 days	M [illegible]	[illegible]	6 months	M [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	42 days	M [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5 weeks	M [illegible]	[illegible]	[illegible]	M [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5 weeks	M [illegible]	$\frac{1}{15}$	[illegible]	M [illegible]	[illegible]	[illegible]

	NAME.		REMARKS.
3	May H.		s examined together.
7	Wm. H. J.	R	eturn.
		L	
8	Chas. F. R.	R	iad previously been under obser- nonths, during which time myopia y increased.
		L	
9	Ella H.	R	sterior staphyloma in each eye.
		L	
0	Anna L. K.	L	eturn.

No	NAME.	Age.	Acuteness of Vision.	Original Myopia.	Treated by Atropine.	Immediate Result.	Primary Improvement.	Interval between Treatment and Second Examination.	Refraction then Found.	Final Improvement.	REMARKS.
1	May H.	11	$\frac{2}{20}$	$\frac{1}{1}$.	31 days	M $\frac{1}{1}$	$\frac{1}{7.0}$	4 months	M $\frac{1}{1}$	$\frac{1}{7.0}$	Both eyes examined together.
17	Wm. H. J. R	22	$\frac{1}{2}$	$\frac{1}{4}$	13 days	M $\frac{1}{1.5}$	$\frac{1}{1.5}$				Did not return.
	L		$\frac{2}{3}$	$\frac{1}{4}$	13 days	M $\frac{1}{1.5}$	$\frac{1}{1.5}$				
18	Chas. F. R. R	19	$\frac{1}{2.0}$	$\frac{1}{2.0}$	6 weeks	M $\frac{1}{2.0}$	$\frac{1}{4}$	8 months	M $\frac{1}{2.0}$	$\frac{1}{4}$	Patient had previously been under observation for six months, during which time my opinion had steadily increased
	L		$\frac{2.0}{2.0}$	$\frac{1}{2.1}$	6 weeks	M $\frac{1}{2.1}$	$\frac{1}{4.0}$	8 months	M $\frac{1}{2.0}$	$\frac{1}{4.0}$	
19	Ella H. R	17	$\frac{2}{3}$	$\frac{1}{1}$	40 days	M $\frac{1}{1}$	$\frac{1}{3.0}$				Small posterior staphyloma to each eye
	L		$\frac{2}{3}$	$\frac{1}{2}$	40 days	M $\frac{1}{1}$	$\frac{1}{3.0}$				
[illegible]	[illegible] L. R. L	13	$\frac{2}{3}$	$\frac{1}{1}$.	26 days	M $\frac{1}{1.0}$	$\frac{1}{2.4.0}$				Did not return

No.	NAME.	REMARKS.
21	Mary W.	
	R	evious to treatment myopia had been
		ressive. Small posterior staphyloma in
		eye.
	L	
22	Annie B.	
	R	
		l not return.
	L	
23	Mr. H.	
	R	
		ry small staph. post. o. d.
	L	
24	Miss W.	
	R	
		staphyloma post.
	L	
25	Miss P.	
	L	is myopia was 1-14 in 1866. It occurred
		e left eye of case 2, and was treated 3
		later, during which time the myopia of
		ight eye remained $\frac{1}{3}$ as before.

No	NAME.	Age.	Acuteness of Vision.	Original Myopia.	Treated by Atropine.	Immediate Result.	Primary Improvement.	Interval between Treatment and Second Examination.	Refraction then Found.	Final Improvement.	REMARKS
21	M... W.										
	R	16	[illegible]	1	6 weeks	M [illegible]	[illegible]	10 months	M [illegible]	0	Previous to treatment myopia had been progressive. Small posterior staphyloma in each eye.
	L		[illegible]	[illegible]	6 weeks	M [illegible]	[illegible]	10 months	M [illegible]	0	
22	Anna B.										
	R	13	[illegible]	[illegible]	6 weeks	M [illegible]	[illegible]				Discontinued.
	L		[illegible]	[illegible]	6 weeks	E	[illegible]				
23	Mr. H.										
	R	16	[illegible]	[illegible]	5 weeks	M [illegible]	[illegible]	17 months	M [illegible]	[illegible]	
	L		[illegible]	[illegible]	5 weeks	M [illegible]	[illegible]	17 months	M [illegible]	[illegible]	Very small and posterior.
24	Miss W.										
	R	17	[illegible]	[illegible]	6 weeks	M [illegible]	[illegible]	6 weeks	M [illegible]	0	
	L		[illegible]	[illegible]	6 weeks	M [illegible]	[illegible]	6 weeks	M [illegible]	0	No staphyloma used.
25	Miss P.										
	L	24	[illegible]	[illegible]	36 days	M [illegible]	[illegible]	4 months	M [illegible]	[illegible]	This eye was I 11 + 1886. It remained in the hospital case 2 and was treated 3 years later, during which time the myopia of the right eye remained [illegible] before.

No.	NAME.	Age	REMARKS.
26	Florence C. R	12	yopia had previously been increasing ıt rapidity.
	L		
27	Cora R. R	11	ɔatient had been considered near- or several years.
	L		
28	Mr. F. R	22	vas case 10, returning three years clining the operation for insufficiency, ıesting a renewal of the atropine t.
	L		
29	Mr. F. R	13	rs before, the myopia of each eye ı 1-18. No muscular insufficiency. rst four weeks of atropinization, my- ıt down to 1-12 in each eye; came vever, the last week.
	L		
30	Master M. R	13	ıtient was first seen a month before ınder treatment. He had then, right eft E. The spasm of accomodation ıded by much pain.
	L		

No.	NAME	Age.	Acuteness of Vision.	Original Myopia.	Treated by Atropine.	Immediate Result.	Primary Improvement.	Interval between Treatment and Second Examination.	Refraction then Found.	Final Improvement.	REMARKS.
26	Florence C. R	12	-	1	42 days	M 1	1	14 days	M -	1	
	L		1/7	1	42 days	M 1	1/4	14 days	M 1	1	The myopia had previously been increasing with great rapidity
27	[illegible] R. R	11	5/7	1	6 weeks	M 1	1/3	2½ mo's	M -	1/2	
	L		5/7	1	6 weeks	M 1	1/1	2½ mo's	M -	1/2	This patient had been examined near sighted five weeks prior
28	Mr. F. R	42	5/7	1	50 days	M 1	1				
	L		2/7	1	50 days	M 1	1				This was case 10, returning three years later, declaring the spectacles insufficient, and requesting a renewal of the atropine treatment
29	Mr. F. R	13	2/7	1	38 days	M 1	0				2+ years before, the myopia of each eye had been 1.18. No increase until now. During last four weeks of the preceding myopia was 1.12 in each eye. Came back, however, the last week.
	L		2	1/8	38 days	M 1	0				
30	M[illegible] M. R	13	[illegible]	1	60 days	H 1	[illegible]	3 months	M 1	1	This patient was first seen a month before became under treatment. He had then right M 1.12 left C. The spasm of accommodation was attended by some pain.
	L		2	1	60 days	H 1	1	3 months	M 1	1/11	

NAME.	Age.	REMARKS.
Miss H. R	21	
L		
Miss F. R	18	l only been complained of a een. A month before being ly 1-36. The spasm relaxed nd of three days, Hm. 1-30; Hm. 1-18; four days later, 1-11 was not reached for
L		
Miss P. R	18	taphyloma o. d.
L		
Kitty J. R	15	ing of weakness of eyes and them. Vision (for distant a fallen off of late. No con-
L		
Nelly S. R	22	pain on use. Considerable ic discs.
L		

NAME.	Age.	Acuteness of Vision.	Original Myopia.	Treated by Atropine.	Immediate Result.	Primary Improvement.	Interval between Treatment and Second Examination.	Refraction then Found.	Final Improvement.	REMARKS.
Miss H.										
R	21	$\frac{20}{40}$	$\frac{1}{8}$	39 days	M $\frac{1}{12}$	$\frac{1}{20}$				
L		$\frac{20}{30}$	$\frac{1}{12}$	39 days	M $\frac{1}{12}$	$\frac{1}{20}$				
Miss F.										
R	18	$\frac{20}{30}$	$\frac{1}{24}$	23 days	Hr $\frac{1}{14}$	$\frac{1}{20}$	2 weeks	Hm. $\frac{1}{2}$	$\frac{1}{14}$	Near sight had only been complained of a year when first seen. A month before being treated it was only 1-6. The spasm relaxed slowly. At the end of three days, Hm. 1-30; two days later, Hm. 1-18; four days later, Hm. 1-14. Ht. 1-11 was not reached for twenty days.
L		$\frac{20}{30}$	$\frac{1}{24}$	23 days	Hr $\frac{1}{14}$	$\frac{1}{20}$	2 weeks	Hm. $\frac{1}{2}$	$\frac{1}{14}$	
Miss P.										
R	18	$\frac{20}{30}$	$\frac{1}{8}$	5 weeks	M $\frac{1}{14}$	$\frac{1}{20}$	14 days	$\frac{1}{14}$	$\frac{1}{20}$	
L		$\frac{20}{20}$	$\frac{1}{14}$	5 weeks	M $\frac{1}{12}$	$\frac{1}{14}$	14 days	$\frac{1}{14}$	$\frac{1}{20}$	Commencing staphyloma o. d.
Kitty J.										
R	15	$\frac{20}{30}$	$\frac{1}{18}$	6 weeks	H $\frac{1}{18}$	$\frac{1}{20}$				
L		$\frac{20}{20}$	$\frac{1}{12}$	6 weeks	H $\frac{1}{18}$	$\frac{1}{18}$				Came complaining of weakness of eyes and inability to use them. Vision (for distant objects) has much fallen off of late. No congestion.
Nelly S.										
R	22	$\frac{20}{30}$	$\frac{1}{8}$	6 weeks	M $\frac{1}{8}$	0				
L		$\frac{20}{30}$	$\frac{1}{8}$	6 weeks	M $\frac{1}{8}$	0				Recently much pain on use. Considerable congestion of optic disc.

No.	NAME.	EMARKS.
36	Miss M. W. R	e had seen distant objects
	L	tness.

No.	NAME.	Age	Acuteness of Vision.	Original Myopia.	Treated by Atropine.	Immediate Result.	Primary Improvement.	Interval between Treatment and Second Examination.	Refraction then Found.	Final Improvement.	REMARKS
[illegible]	Miss M. W. R	18	$\frac{1}{2}$	$\frac{1}{4}$	5 weeks	E	$\frac{1}{4}$				Two years before had seen distant objects with [illegible] distinctness
	L		$\frac{2}{3}$	$\frac{1}{4}$	5 weeks	E	$\frac{1}{4}$				

CASE OF EXTREME MYOPIA. By Henry D. Noyes, M.D., New York.

R. R. H., a boy 15 years old, weighing 98 lbs., of delicate appearance, was brought to me by his parents from his home in Detroit, Michigan, at the instance of Dr. J. F. Noyes.

The boy's father is a man of great strength and stature; his mother is quite small in figure. Neither have any defects in sight. The patient is the sixth child and the only one who has any eye troubles. His health has of late years been tolerably good, but at 6 years of age he had frequent and severe headache.

The manner of the boy indicates that his sight is extremely deficient:—he walks about groping his way. He has learned to read with difficulty, and holds a book so close to his face as to rub the end of the nose over the page; he at the same time inclines the head to one side and uses only the right eye. The eyeballs are set rather deeply in the orbits, the palpebral fissures are of about the usual size, and the left eye has a convergent squint. Nothing in the external appearance of the eyes would suggest the great amount of myopia which was actually found.

Attempts to determine the visual acuteness were at first unsatisfactory; the pupils were then dilated, and the conditions found by the ophthalmoscope were as follows:—The fundus perfectly illuminated, no opacity in the media. The lenses shake, the left lens partially luxated upward, and in the right eye it is possible to look beyond the edge of the lens through the suspensory ligament. It is thus evident that both lenses are small, and the anterior part of the vitreous is fluid. Attempts to see the fundus by the upright image proved abortive.

A combination of two concave glasses, each of two inches focus, was the strongest negative glass I could obtain, and with them the dispersion of light was so great that no illumination and no image could be obtained. The only way of gaining a near view of the fundus was by using a convex lens of two inches focus, either more or less, to magnify the spontaneous aërial inverted image. By this method it was decided, by measuring the distance between my own and the patient's head, when my eye was withdrawn to the greatest distance at which, with the convex glass, a distinct image of the vessels could be preserved, that the myopia must be about one inch. The presence of a decided amount of astigmatism was also recognized. By the customary method of the inverted image, the fundus could be seen to greater extent, and it was found that there was no atrophy of the choroid about the nerve-discs, while at the region of the maculæ there was a brownish discoloration indicating lesion of the choroid. The vitreous clear and no signs of cataract.

The thought occurred to me whether it would not be right to remove the crystalline lenses as a means of abating the myopia. But although appropriate in theory, the attendant risks were estimated to be too high to justify the proceeding.

I ordered the following glasses: for distance, Right —1 spherical —6 cylindrical, axis 180°; Left $-\frac{5}{6}$ spherical —4 cylindrical, axis 180°.

With these, using only one eye at a time because of the converging strabismus, he had V. $= \frac{20}{100}$.

For reading I employed a pair of Steinheil's cones, each having $4\frac{1}{2}$ inches negative focus. They were mounted ingeniously by Mr. Hunter in a frame which permitted them to be adjusted to the needful angle of convergence and to the correct distance from each other. They were set in blackened sheets of brass and in a spectacle-frame.

With their help the boy could read S. 5 at 6 inches. With an ordinary concave glass of this focus he could read but little better than with his unaided eye. In this exceptional case the magnifying power of the Steinheil glass conferred a great advantage. The cones were about an inch in length, and at the convex end about $\frac{1}{2}$ an inch in diameter, while the concave end

had about ¼ inch diameter. They constitute small Gallilean telescopes.

The awkward appearance and weight of these glasses makes it usually impracticable for patients to use them, but the patient was not only willing but delighted to wear them.

I subsequently learned that when using any glasses he had diplopia. It will not be difficult to correct this by tenotomy of the rect. interni.

Cases of myopia amounting to this degree are extremely rare, although we see cases needing glasses of 2½ and 3½ inches not very unfrequently.

If we attempt to show by calculation what must be the length of the optical axes of these enormously prolonged eyes, and use for this purpose the formula which Mauthner gives, taking the Paris inch, as he does, at 27.1 millimetres, we have for the right eye a length of axis of 37.647 millimetres. In this calculation, as is well known, the standard is Listings' diagrammatic eye, with a length of 22.23 millimetres.

VISUAL ACUTENESS = $\frac{1}{8}$ to $\frac{4}{16}$. Dr. B. Joy Jeffries, Boston.

To avoid needlessly adding to our Transactions, I must, in connection with this article, refer to my previous ones in the Transactions of our Society for 1869, p. 43, and in the Report of the London Ophthalmological Congress, 1872, p. 121. I would also refer to Giraud-Teulon's remarks on my first article in the March-April number, 1872, p. 218, "Annales d'Oculistique," as well as Dr. J. Gayat's article in the Congress Report, p. 190.

July 15, 1874, I have tested my vision again in the same locality and under similar conditions; namely, the thermometer standing at nearly 90° in the shade, where I was placed, and the test-types in the sun, except as will be mentioned. I was in better physical condition at this time than when making the experiments two years ago, reported at the Congress. Where I could not read all the letters, I follow the fraction representing vision with the sign *minus*, and where I could read all the letters more than readily, so to speak, with the sign *plus*.

Dyer's Card in sun, I in shade	V. = $\frac{4}{2}\frac{7}{0}$.
Snellen's Card in sun, I in shade	V. = $\frac{4}{2}\frac{7}{0}$. } Same, white letters or black.
Green's Long Horizontal Card in sun, I in shade	V. = $\frac{4}{2}\frac{7}{0}$, } and $\frac{4}{1}\frac{7}{6}$, reading the letter T.
Green's Long Vertical Card in sun, I in shade	V. = $\frac{4}{2}\frac{7}{0}$.
Green's Long Vertical Card in sun, I in shade	V. = $\frac{3}{1}\frac{8}{6}$ —.
Green's Long Vertical Card in sun, I in shade	V. = $\frac{3}{1}\frac{5}{6}$ +.

Green's Long Vertical Card in sun, I in shade..... V. = $\frac{2}{1}\frac{7}{3}$.

Green's Long Vertical Card in sun, I in shade..... V. = $\frac{2}{1}\frac{2}{0}$.

Green's Long Vertical Card in sun, I in shade..... V. = $\frac{1}{8}\frac{7}{}$.

It will be noticed that V. decreased as I went down the card, sustaining a criticism I made in reference to these test-types five years ago.

Dyer's Card in the sun, I in the shade within the house..... V. = $\frac{5}{3}\frac{8}{0}$ +.

Dyer's Card in the sun, I in the shade within the house..... V. = $\frac{7}{4}\frac{2}{0}$ +.

Green's Long Horizontal Card in the sun, I in the shade within the house ..... V. = $\frac{7}{4}\frac{2}{0}$ to $\frac{7}{3}\frac{2}{2}$.

Dyer's Card in changing sun and shade from moving foliage, whilst I looked through a series of rooms, My..... V. = $\frac{1}{5}\frac{0}{0}\frac{0}{}$.

Dyer's Card in changing sun and shade from moving foliage, whilst I looked through a series of rooms, My..... V. = $\frac{9}{4}\frac{0}{0}$ —.

Dyer's Card in changing sun and shade from moving foliage, whilst I looked through a series of rooms, My..... V. = $\frac{7}{3}\frac{0}{0}$.

Dyer's Card in changing sun and shade from moving foliage, whilst I looked through a series of rooms, My..... V. = $\frac{5}{2}\frac{3}{0}$ —.

In making these experiments, I took the same precautions as before, not to be familiar with the letters—even writing them down as I saw them, and comparing them afterwards with the tests. One peculiarity I noticed worth mentioning to any one trying their vision. I found it would not do to look down at my paper and write the letter seen, as then the ciliary muscles would not relax my accommodation very readily, and it was some seconds before the focus was adjusted for distant vision or parallel rays. Moreover, the sudden changing quite threw me out in my experiments—producing decidedly uncomfortable fatigue.

I have thus again recorded my vision far above $\frac{20}{20}$, notwithstanding Giraud-Teulon's expressed doubts. I therefore would once more ask, is my vision so very much better than practised emmetropes? I should have lost half my visual power, as we now measure it, to have read the twenty-feet test-types at that distance only.

A NEW MODIFICATION OF THE OPHTHALMOSCOPE.

By E. G. Loring, Jr., New York.

As it is considered by some an improvement to have the glasses covered, the following instrument was devised, which, it was hoped, would meet this requirement and at the same time

Fig. 1

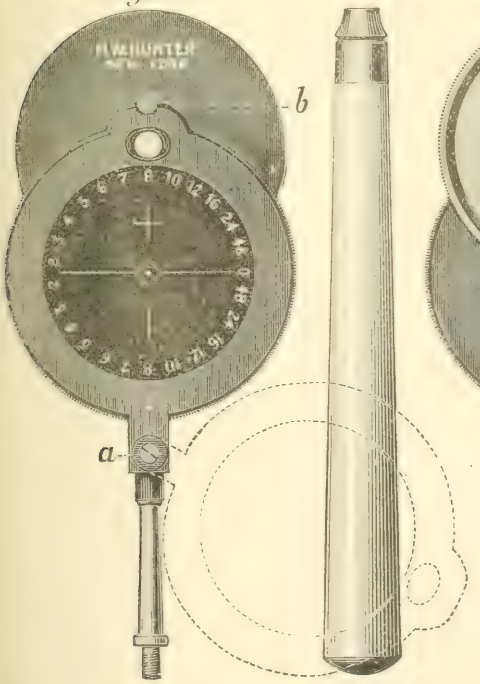
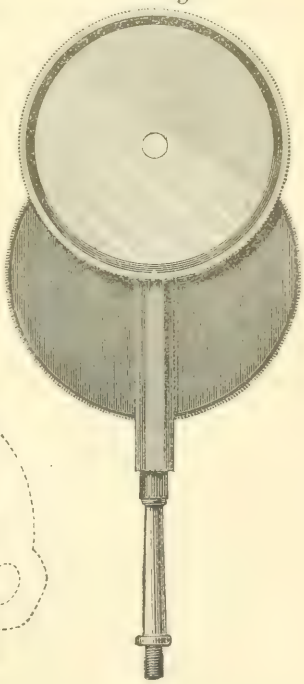


Fig. 2



leave the number of the glasses open to inspection, so that their relative positions could be told at a glance and the required

number turned to at once. This object was obtained by having the cover in the shape of a thin, flat ring which swings round a pivot, as seen in the drawing at the point *a*.

The cover when closed is kept firmly in position by sliding with a little pressure beneath the peg, *b*. A spring is countersunk in the upper part of the handle, which bears on the disc so as to keep it firm, and serves at the same time to centre each glass by dropping into a small hole beneath it. The disc can be rotated either with or against the sun, and can, if occasion require, be turned by the forefinger without removing the instrument from the eye. To clean the glasses, the cover is simply made to swing round the pivot at *a*, in the direction shown in the drawing by the dotted line, when, on reversing the instrument, the disc drops out of itself. There are no loose screws about the instrument. Its price, as made by Mr. H. W. Hunter, 1132 Broadway, New York, is $30.

DESCRIPTION OF THE FIGURES,

ACCOMPANYING DR. W. F. NORRIS'S CASES OF OPTIC NEURITIS.

I. Sarcoma of the Cerebellum.

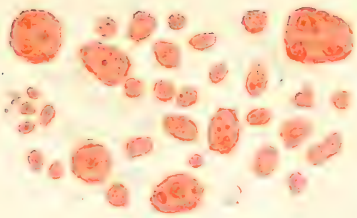
II. A portion of the Tumor teazed out and magnified 550 diameters, showing large polynucleated cells, smaller granular ones, and scanty fibrillar matrix.

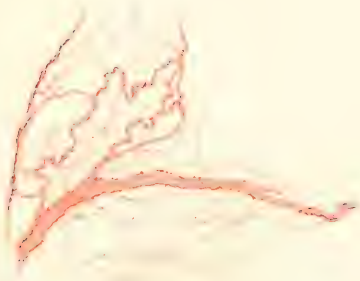
III. Section of Choked Disc, stained with carmine, magnified 36 diameters.

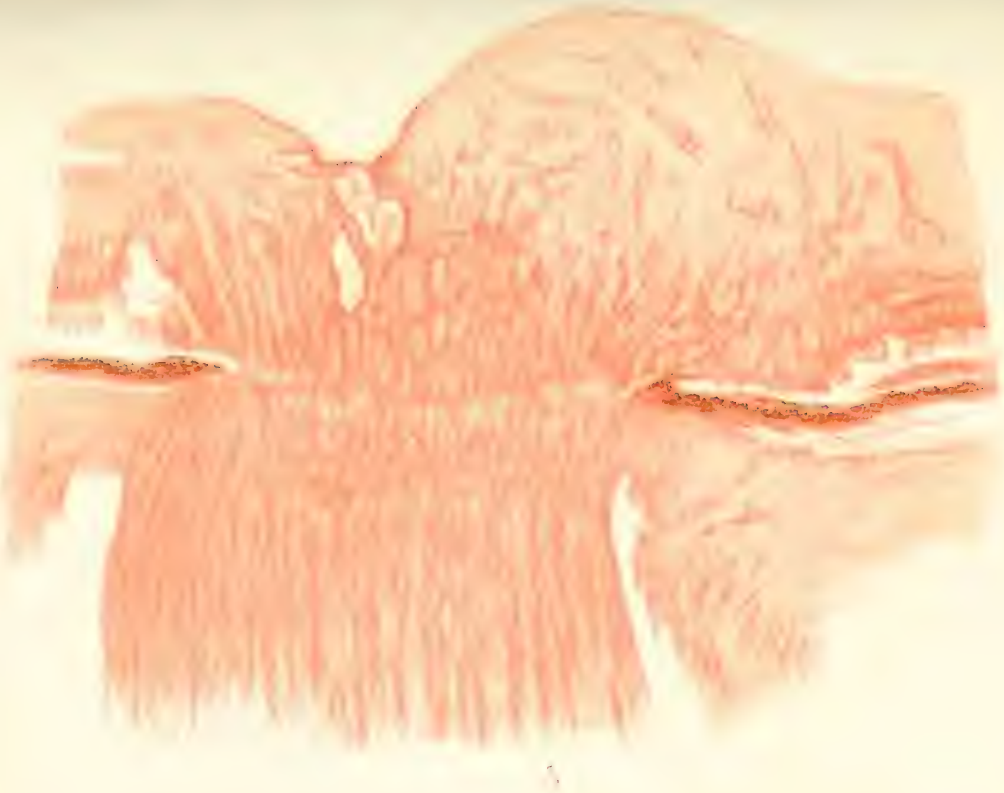
IV *a*. Nerve Fibres teazed out from a similar section to the foregoing, with large spindle-shaped varicosities.

b. Flat ovoid Nuclei of Connective Tissue, 550 diameters.

V. Optic Neuritis from Lead Poisoning, 36 diameters.







CASES OF OPTIC NEURITIS. By William F. Norris, Philadelphia.

I. OPTIC NEURITIS FROM CEREBELLAR SARCOMA.

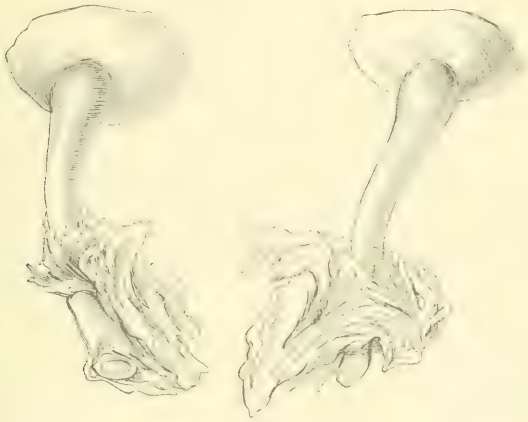
A. J. A., æt. 28, born in Philadelphia, and clerk by occupation applied for advice at the Wills Hospital in November, 1873. He states that two years ago, last June, when walking home from his work, he was attacked with severe pain in the occiput, shooting forward into the forehead. This recurred from time to time, and he soon became subject to nausea and vomiting, which was especially apt to occur on rising in the morning. Although he gradually became more feeble and suffered from severe attacks of headache and nausea, he was nevertheless able to continue his work until two months ago, when, on entering the house, he suddenly staggered and fell; his hands were at the time feeble and tremulous, but his mind remained perfectly clear. His sight soon became so dim that he was unable to do any work, and his gait, which had been unsteady ever since his first attack, was now so tottering that he could scarcely walk even with the aid of a cane.

At the date of his admission to the hospital he was pallid and rather obese; his intellection was slow but unimpaired, and he complained of failing sight, intense headache brought on by any slight exertion, morning vomiting, dizziness, and pain along the lower margin of the ribs on both sides. He had a vacant, staring look, partial dilatation of both pupils, paresis of both external recti—most marked on the right side—together with feebleness of the lower limbs and great difficulty in co-ordinating their movements. When endeavoring to walk to any given point he always brings up considerably to the left of it. Vision in the left eye $\frac{10}{c}$; in the right, counts fingers at a few

feet. Ophthalmoscopic examination showed that the discs were very prominent and their normal boundaries entirely obscured. Both showed a large development of capillary vessels; that of the right eye, however, was commencing to undergo atrophy, having already acquired a bluish-white tint. The summit of the right disc was visible with $+\frac{1}{8}$, that of the left with $+\frac{1}{12}$, and the fundus near the equator of each eye with $+\frac{1}{4}$. He remained for a considerable time in the house without essential change, subject at times to intense headaches in which his pulse would vary from 90 to 116, and his temperature under the tongue from 98° to 100.5°. At such times even the slight strain caused by the contraction of his abdominal muscles in endeavoring to pass his water occasioned intense pain in the head, and this was still more marked in the act of defecation. These paroxysms were also attended with marked deterioration of sight, and he would sometimes for several hours lose all perception of light. Once, after walking from the water-closet to his bed, he was entirely unable for some time to move either legs or arms. Subsequent to this attack there was intense headache on the slightest motion, and great dimness of vision. At times he complained of seeing stone walls covered with purple vines, and occasionally a medley of horses, coaches, etc. There was a partial loss of sensibility and motion on the right side of the face, and he would sometimes complain that that cheek "got in his way while eating." The amount of squint also varied from time to time. He gradually became weaker and weaker, and died on the third of April, so quietly that neither the attendants nor the patients in the ward marked the exact time. An autopsy was made seven hours after death. There was marked rigor mortis, considerable discoloration of the extremities, and marked settling of blood about the ears and head. The veins leading from the diploe to the scalp were gorged with black blood, as were also the veins and sinuses of the dura mater. There was no trace of meningitis, and the brain seemed healthy, except that its ventricles were distended with clear serum, and that there was a large quantity of the same fluid in the arachnoid cavity.* The cere-

* Spinal and cerebral. After removal of the brain, an abundance of it welled up out of the spine.

bellum was externally healthy, but on incising it there appeared a bluish-gray tumor extending transversely through it with numerous bright red vessels ramifying in its substance. (Vide Fig. I.) The roofs of the orbits were broken through and the posterior halves of the eyeballs removed together with the entire length of the optic nerves. The optic papillæ were prominent, of a dusky grayish-white color, and their boundaries hazy and indistinct. The outer sheaths of the optic nerves were considerably distended, especially at their peripheral extremities, a condition better shown by the accompanying wood-cut than by any verbal description. A fresh piece of the cerebellar tumor teased out



and placed under the microscope showed numerous blood-vessels crowded with colored corpuscles. The cells of the adventitia were large and granular, with large and distinct nuclei. The structure of the tumor itself was better seen on treating the specimen with a dilute solution of nitrate of silver, and showed numerous round cells with granular protoplasm, some about the size of a retinal granule, others larger and polynucleated. These were embeded in a scanty granular, and in places delicately fibrillar, matrix.* Carmine and glycerine gave the same results, but less distinctly than nitrate of silver.

The posterior halves of the eyeballs and optic nerves were

* Fig. II.

hardened in dilute alcohol, and subsequently sections of the same were made, stained with carmine and mounted in balsam. Microscopic examination showed that the disc was considerably swollen, measuring on the dried and mounted specimen $\frac{1}{20}''$ from the level of the choroid to the summit of the papilla. The lamina cribrosa was also swollen, bulging forward into the eye, and the whole tissue stained deeply and intensely with the carmine solution—far more intensely than a healthy adult nerve, but recalling vividly the aspect of a similar section made through the optic nerve of a fœtus (embryonal tissue . (Vide Fig. III.) Some sections of the swollen disc were carefully teased out with needles, and the nerve-fibres showed numerous spindle-shaped swellings which stained with carmine more deeply than the rest of the fibre. (Fig. IVa.) Adhering to the nerve-fibres were very numerous ovoid flattened nuclei, evidently belonging to the interstitial connective tissue. (Vide Fig. IVb.) There were numerous newly formed blood-vessels, and their adventitia was thickly studded with large granular nuclei. It was principally to the abundance of the nuclei of the connective tissue, and to those in the walls of the numerous blood-vessels, that the opacity of the tissue and its intense staining were due. The trabecular network found in the subvaginal space seemed more abundant than usual, and its nuclei stained deeply with carmine. (Fig. VI.)

There was, however, no such massing of this subvaginal connective tissue as to cause any distension of the outer sheath of the nerve. This had evidently been produced by the increased quantity and pressure of the subarachnoid fluid.

As tending to confirm this view, it may not be out of place to remark that a pear-shaped dilatation of the bulbar end of the optic nerve (similar in appearance to that above figured) is readily produced in the cadaver by inserting the nozzle of a syringe between the outer and inner sheaths and forcibly injecting any fluid.

II. A CASE OF OPTIC NEURITIS FROM LEAD-POISONING.

The clinical history of this case has already been published by Doctor J. H. Hutchinson, in the *Philadelphia Medical*

Times, January 17, 1874, and it is to his kindness that I am indebted for the opportunity of studying it. I will therefore recapitulate briefly its clinical aspect, and pass on to a discussion of its microscopic appearances. The patient was a young woman poisoned by the application of white-lead to the skin as a cosmetic. M. C., æt. 23, enjoyed good health until two months previous to her admission to the Pennsylvania Hospital, when she began to suffer from headache and loss of appetite, followed by violent gastric pain, nausea, and vomiting. At the time of admission to the hospital, there was a marked blue line in the gums, and soon after she was seized with epilepti-form convulsions, and died in the third. Between these paroxysms, I made with some difficulty an ophthalmoscopic examination of the right eye. The disc was prominent, its outlines were hazy, its color an opaque bluish-white, sclerotic ring not visible, and the vessels diminished in calibre. There were no choroid changes. Doctor Hutchinson made a careful autopsy, and reports that the veins and sinuses of the dura mater were gorged with fluid black blood; that the brain substance was exceedingly anæmic and the gray matter of rather a yellowish hue, and that there was a marked increase in the quantity of the cerebro-spinal fluid. The membranes of the brain were entirely healthy. The posterior halves of the eyeballs were handed to me for examination. The outer sheath of each nerve was distended, and the bulbar extremity pear-shaped. The optic papillæ were prominent, bluish-white, and opaque, the sclerotic ring not visible, and there were no choroidal changes. After careful hardening, longitudinal sections were made of the nerve and the optic disc. The distance from the level of the choroid to the summit of the disc measured $\frac{1}{18}''$. There were numerous capillary vessels throughout the swollen disc, their walls studded with large granular nuclei, and a moderate development of the ovoid flattened nuclei of the connective tissue. (Vide Fig. V.) In specimens carefully teased out, the nerve-fibres themselves appeared to be nearly normal, for, although a few of them exhibited in places a slight increase of diameter at some places where they also stained more deeply with carmine, there was, nevertheless, nothing at all comparable to the large varicosities and spindle-shaped swellings found in the nerve-fibres of the first case.

The subvaginal connective tissue was apparently in a state of nutritive hyperplasia, and stained deeply with carmine.

In both of the foregoing cases sections were made of the posterior portions of the optic nerves, and compared with those obtained at the optic entrance, and in both (although this was better marked at the bulbar extremity) there was obviously throughout an increase of the interstitial connective tissue beyond the normal amount, while the unusually intense staining of its too numerous nuclei bore witness to the increased activity of its protoplasm. In short, all sections forcibly recalled the appearance of similar portions of the fœtus, having by inflammatory hyperplasia assumed an embryonal appearance.

The excess of cerebro-spinal fluid and the dilatation of the outer sheath of the optic nerves, and consequent increase of the subvaginal space, would seem to show that in these cases at least the choked disc had been produced by the pressure of the subarachnoid fluid at this point. It might be supposed that if this were the case, and the choking due to the action of this mechanism already so fully elucidated in the labors of Schwalbe, Schmidt, Manz, Michel, and others, that the inflammatory changes would be limited to the region of the lamina cribrosa. We have found, however, that although most intense at that point in its vicinity, they were not limited to it, but extended backward throughout the orbital portion of the optic nerve. This we can readily account for when we consider that Schwalbe as well as Axel Key, and Retzius, have demonstrated that fluids injected into the subvaginal space readily pass into the lymph spaces in the interior of the nerve, which surround and separate the individual nerve-fibres, thus producing throughout its length œdema and nutritive hyperplasia.

Tumors of the cerebellum and of the posterior portions of the hemispheres of the cerebrum appear more apt to produce choked disc than those of the anterior lobes. The cranium is a closed cavity, and any increase of its contents, if they were all fluid, would press equally in all directions. But inasmuch as the brain is a soft solid, this law does not hold good, and tumors of the cerebellum, bound down by the tentorium, by their direct pressure on the fourth ventricle cut off all communication between the lateral and third ventricles of the brain and the sub-

arachnoid space of the spinal cord, and thus dam up fluid in the former. Moreover by compressing the lateral sinuses of the dura mater, they readily cause leakage of the watery parts of the blood, and are thus specially prone to increase the subarachnoid fluid.

It is perhaps worthy of remark as a clinical fact, that the temperature in the first reported case never, even in his most violent paroxysms of pain, rose above 100.5°, and the autopsy showed an entire absence of meningitis. Had it been present it would probably have been indicated by a more decided rise of the thermometer.

ON THE CIRCULATION OF THE OPTIC NERVE AND RETINA IN DISEASE OF THE SPINAL CORD AND MEMBRANES DEPENDENT UPON CARIES OF THE VERTEBRÆ. By Charles S. Bull, M.D., New York.

The clinical observations contained in this short paper were made upon a series of eleven cases, all children, who were inmates of the Hospital for Ruptured and Crippled, in New York. They were all of traumatic origin, the primary lesion being a caries of the spinal vertebræ, involving one or more vertebræ, mostly in the cervical region, but occurring also in the dorsal and lumbar regions. No attempt is made to explain the cause of the disturbance in the circulation of the optic nerve and retina, and the cases are only presented in the hopes of eliciting some information.

The *first* case was a young Jewish boy, 4 years of age, with caries of the dorsal vertebræ from the 6th to the 12th inclusive. He is one of six children, the rest of whom are perfectly healthy; but this child had been rather feeble from birth. When he was about two years old, he met with a severe fall, striking on his back, and since then he has never been able to walk. The child had two large abscesses in the inguinal regions of both thighs, and a convergent squint of 3 ″ in the left eye, which, the parents say, appeared soon after the accident. An ophthalmoscopic examination, after atropine, showed a hypermetropia of $\frac{1}{4}$, which might account for the squint. Both optic papillæ were of a deep red, the retinal veins were very much engorged and tortuous, the arteries apparently normal in calibre. The retinæ of both eyes were thrown into minute rugæ or folds separated by unequal distances. The minute vessels of the pa-

pillæ were undoubtedly increased in size and perhaps in number, as shown by the deep-red color.

The *second* case was a boy, 3½ years of age, with caries of the cervical vertebræ from the 4th to the 7th, which dated back to a fall about six months before. An abscess had made its appearance deep in the neck on the left side, which had been opened about one month before I saw him, and was still discharging a fetid pus. The ophthalmoscope showed a deeply congested appearance of the entire fundus in both eyes, with enlarged and tortuous retinal veins, and a similar appearance of the arteries, though to a less degree. The refraction was emmetropic.

The *third* case was a boy, 11 years of age, with caries of the middle and lower dorsal vertebræ, of traumatic origin, and of eighteen months' standing. There was no paraplegia either of motion or sensation, but the boy never walked since the accident, because of the pain caused by the motion of the vertebræ upon one another. There was an abscess extending from the trochanter major to the patella on the right side, and the house physician suspected amyloid degeneration of the kidneys. There were never any head symptoms at any time. Both eyes have the appearance of neuritis descendens, with marked effusion into the disc and retina, giving them a sodden, yellowish-white appearance. The veins were very tortuous and much engorged, the arteries quite small, and the outline of the disc was entirely lost in both eyes.

The *fourth* case was a boy, 10 years of age, with caries of the middle and lower dorsal vertebræ, of traumatic origin, dating back seven years. The father of the child died of pulmonary tuberculosis, and two children of the same family died of cerebral disease. In this patient both optic discs were markedly anæmic, particularly in the left eye. The arteries and veins of the retina were both reduced in size, and the retina so devoid of pigment that the choroidal vessels were plainly visible all over the fundus, which was very unusual, as the patient was a dark brunette. The refraction was $+\frac{1}{20}$.

The *fifth* case was a boy, 14 years of age, with caries of the dorsal vertebræ, from the 1st to the 7th inclusive, of traumatic origin, dating back five years. The patient has been paraplegic

for nearly two years. He at one time recovered the power of motion in his legs, then lost it again, and he is now slowly regaining it. The ophthalmoscope showed a high degree of hyperæmia of the optic papillæ, with engorged and pulsating retinal veins, but no exudation into the retina, and no alteration in the arteries.

The *sixth* case was a boy, 9 years of age, with caries of all the lumbar vertebræ of fourteen months standing, dating from a heavy fall three years before. There is no paraplegia, but the boy is bent over forwards and has some difficulty in walking, from a very marked contraction of the tensor vaginæ femoris.

In this patient both papillæ were very anæmic, almost as much so as in progressive atrophy, yet the retinal veins were engorged and tortuous, and the outlines of the disc indistinct. Refraction —36.

The *seventh* case was a boy, 14 years of age, with caries of nearly all the dorsal vertebræ, and a marked displacement of the spinal column towards the left side. This patient fell through a hatchway nine months before I saw him, struck on his back, and was paraplegic from that time. About two months ago he began to walk, and the improvement in this respect has been constant. Both optic discs were very much congested, with an enormous development of vessels upon the disc and retina, but no pulsation. Refraction emmetropic.

The *eighth* case was a boy, 7 years of age, with caries of the vertebræ from the 6th cervical to the 4th dorsal, of four years' duration, and traumatic origin. He has been paraplegic for seven months. For some two years he has had symptoms of renal disease, and has suffered at times from incontinence of urine. The pressure on the spinal cord is gradually diminishing and the spinal nerves are slowly regaining power. In the right eye the optic disc was intensely hyperæmic, its outline indistinct, and the veins engorged and tortuous. In the left eye there was the same condition of affairs, though less marked. In this eye there was a venous pulsation. The patient complains a great deal of photophobia and pain in the eyes.

The *ninth* case was a girl, 2 years of age, with caries of the cervical and dorsal vertebræ of three months' standing. She can walk a little, but drags the left leg behind the other. Com-

plains of pain in the back, and always lies on the right side. There was a very marked hyperæmic condition of the optic papillæ, with immensely distended and tortuous veins, and a pulsation in both branches of the vein in the left eye.

The *tenth* case was a girl, 4 years of age, with caries of the middle dorsal region, involving three vertebræ, of six months' standing. The dorsal projection is very prominent, but the child complains of no pain except when the back is touched. There is no interference in the movements of the muscles of the lower extremities, and the child is well nourished and in good condition. The optic papillæ were deeply congested except at the centre. The central veins were very much engorged, but the chief feature was the very marked increase in size of the capillaries of the disc, some of which could be seen with the naked eye. There was no exudation of any kind into the retina, the media were perfectly clear, and the refraction emmetropic.

The *eleventh* case was a boy, 5 years of age, with caries of the dorsal vertebræ of one year's duration, involving the 6th, 7th, 8th, and 9th vertebræ. The child has never complained of any pain, but is completely paraplegic, and is very much wasted away. In the right there was a marked interstitial atrophy of the hexagonal pigment cells of the retina immediately around the nerve. The nerve-entrance was somewhat hyperæmic, but not markedly so, but the veins were enormously engorged and very tortuous, and pulsated for some distance beyond the margin of the disc. In the left eye there was the same interstitial pigment atrophy, and the disc and veins were equally engorged, but there was no pulsation. The arteries in both eyes were not apparently altered in calibre.

SYPHILITIC GUMMA IN THE CILIARY BODY. By Edw. G. Loring, Jr., and H. C. Eno, New York.

The patient was a well-developed woman of thirty years of age, and at the time of the attack was apparently in perfect health, and without the slightest signs of a syphilitic cachexia. Five years before, she had had a chancre, for which she had been treated in the regular way. The primary lesion was followed by the usual secondary, and these in their turn by the so-called tertiary, symptoms.

Three years after inoculation, and two years before the present trouble, the patient suffered from an attack of iritis in both eyes, and they had remained "weak" ever since.

The present attack was ushered in by similar symptoms, and the belief on the part of her attending physician was that the patient was suffering from a second attack of iritis. The trouble was, however, confined entirely to the left eye. The injection of this eye gradually increased for about a week or ten days, unaccompanied, however, by much pain or loss of vision. The patient was, however, shortly after awakened at night by a sudden and very violent attack of pain with a very rapid loss of sight, which in a day or two resulted in total blindness. Becoming alarmed, the patient presented herself at the Eye and Ear Infirmary, where I saw her for the first time, about two weeks after the beginning of the attack.

The right eye at this time appeared to be perfectly normal in every respect. The left was very much injected, and the conjunctiva, besides being very much inflamed, seemed, in conjunction with the sub-conjunctival tissue, to be thickened and œdematous, especially to the outer side of the eye. The

anterior chamber was filled by a yellowish exudation, so that the iris was concealed from view. The cornea was, however, free from any ulcerative process, and the epithelial layer was intact. There was no perception of light.

As the patient was suffering violent pain in and around the eye, and as she would not consent to have the eye removed without the consent of her friends, it was decided to do a free paracentesis. This was done with a Graefe's knife, a free incision being made in the lower margin of the cornea. The anterior chamber was thoroughly evacuated. This was followed by a great relief of pain.

The wound, however, gradually closed, and with its closure the pain returned, and the exudation began to reappear in the anterior chamber. The other eye (the right), which up to that time had shown no trace of any trouble, began now to be somewhat sensitive to light, and to show other symptoms which seemed to be of a sympathetic nature. Enucleation was therefore performed, and the eye given to Dr. Eno, whose description of the examination will be found below.

The enucleation of the left was followed by an amelioration of the condition of the right eye, so far as the dread of light was concerned; but four days after the operation a small circumscribed elevation began to make itself apparent in the line of the insertion of the rectus externus, but somewhat closer to the cornea. This had the appearance of a circumscribed elevation of the sub-conjunctival tissue, the conjunctiva proper being but slightly injected just over it. This injection of the conjunctiva proper gradually increased, following the line of the rectus externus muscle, till, within two or three days, it had spread out in a fan or cone like shape, the base of which was toward the external canthus, and the apex, sharply defined, towards the cornea.

At this time a serous exudation underneath the conjunctiva began to make its appearance, being limited to the external and lower part of the eye. The injection of the eyeball gradually extended round the cornea, above and below, till it had included the whole eye. Still the region over and around the tendon of the externus was the seat of the most marked symptoms of the trouble, and from the serous

exudation it was supposed that something was interfering with the circulation of both the superficial and deeper parts of this portion of the eye. At this time a grayish, spongy exudation began to be apparent over that part of the iris opposite the insertion of the externus rectus. This extended itself pretty rapidly in a circuit round the upper portion of the iris, so that on the day after it had been first noticed the exudation had extended over about two-thirds of the entire membrane, leaving the outer and lower parts unaffected. This exudation had a very peculiar appearance, looking more like mould of a grayish yellow color than anything I can compare it to. It projected over the edge of the iris into the pupillary space; and vision, which had hitherto remained good, now sank rapidly, so that the patient could barely count fingers at four feet. On the following day this semi-transparent exudation had extended all round the iris and was occupying the greater part of the anterior chamber. Through it the iris could be dimly seen, of a dull velvety hue. Vision was so bad that fingers could be barely counted at a foot and a half. The pupil was contracted, though not markedly so, and there were no adhesions to the lens, as was afterwards shown by the free dilatation of the pupil under atropine. Specific treatment had from the first been pushed vigorously without apparently checking the progress of the disease, and great fears were entertained that the eye would follow in the same course as its fellow.

On the following day, however, the exudation began to be absorbed, and disappeared so rapidly that within thirty-six hours after its commencement the anterior chamber was entirely free from it. Vision immediately rose and the eye made a steady and rapid recovery.

The left eye was placed in Müller's fluid immediately after enucleation. The eyeball appeared normal in size and shape, with the exception of a very considerable thickening of the episcleral tissue at the outer side of the cornea, and over the insertion of the rectus externus. The cornea was opaque, and there was a large cicatrix in the lower portion of it. At the end of two weeks the eye was removed from Müller's fluid and opened by a section passing nearly through its horizontal

meridian. The antero-posterior diameter of the eye measured 26 mm., the transverse diameter 25 mm. As seen in this section, the episcleral tumor above-mentioned is about 1½ mm. in thickness, and extends back nearly to the equator of the eyeball, inclosing in its substance the tendon of the rectus externus. The anterior chamber is filled with a mass of yellow exudation completely blocking up the pupil. The iris and ciliary body are enormously increased in size, but especially at the outer portion of the eye corresponding to the external swelling; here the iris measures 1½ mm., and the ciliary body 3–4 mm. in thickness; here also the substance of the iris and ciliary body seems to be continuous with the mass of exudation in the anterior chamber, the ligamentum pectinatum iridis being broken through. The ciliary tumor is of quite firm consistence and yellowish in color. It extends backwards to the region of the ora serrata, where it gradually is lost in the choroid, which appears to be but slightly increased in thickness.

The lens is transparent and normal in appearance, but pushed over to the nasal side by the swelling of the ciliary body on the opposite side of the eye. The vitreous is cloudy. The retina and choroid are in place. The sclera is normal in appearance, and may be seen as a white band separating the intra from the extra ocular tumor. (See accompanying plate, Fig. 2.)

Microscopic examination shows that the episcleral tumor is due to an infiltration of the episcleral tissue, with a multitude of round cells. The cells are distributed between the fibres of the connective tissue, and the blood-vessels of this region are enlarged and engorged.

At the limbus a collection of cells is so disposed as to separate the lam. elast. ant. with the superjacent epithelium from the corneal tissue for a considerable distance. The rest of the cornea presents the appearances of moderate keratitis. The anterior chamber is filled with a mass composed of round cells and coagulated fibrine. The outer layers of the sclera are invaded by the cell-growth, and throughout its whole thickness collections of round cells may be seen lying between the bundles of fibrous tissue.

Thin meridional sections were made through the centre of the

ciliary tumor, and the iris and ciliary body were found to be infiltrated with a great quantity of the same small round cells as exist in the episcleral tumor. (Fig. 1.)

In that portion of the ciliary body near the sclera, the cells are distributed between the bundles of muscular fibres; and as we pass toward the inner surface of the ciliary body, they become more numerous, separating the muscular bundles more and more widely, until, at the inner margin, we can distinguish only a mass of cells thickly packed together and traversed by an occasional capillary vessel. These cells are identical in appearance with the so-called exudation, or lymphoid cells, being about the size of a white blood-corpuscle and containing a granular nucleus. In no portion of the tumor do they present the appearances of granular or fatty degeneration.

In the iris the cells are very abundant, and in those portions most affected it is scarcely possible to recognize any element of normal iris tissue, except the pigment. The inner and under surface of the ciliary body and iris are also thickly covered with masses of round cells. The vitreous is filled with round cells and coagulated fibrine.

The retina and choroid of the posterior portion of the eye were examined, but presented no unusual appearances beyond those of an inflammatory condition.

In view of the clinical history and pathological appearances of this case, it must be regarded as one not merely of Irido-cyclitis syphilitica, but also of syphilitic gumma of the ciliary body and iris. For though the lesions do not differ essentially in kind from those of a simple inflammatory origin, still their intensity and circumscribed character together with the formation of a distinct tumor justify the name *gumma*, notwithstanding the absence of retrogressive metamorphosis.

The observations of three similar cases have been recorded, one by Von Hippel (Graefe's A. f. O. viii. p. 288), two by F. Delafield (Transactions of the American Ophthalmological Society, 1871); but in all these cases the disease was more advanced and the changes more extensive, involving all the tissues of the eyeball.

ON COLOR-TESTS FOR AMETROPIA, BASED UPON THE CHROMATIC ABERRATION OF THE EYE.

By John Green, M.D., St. Louis, Missouri.

The following brief paragraph from Dr. Thomas Young's *Bakerian Lecture*, published in the *Philosophical Transactions* for 1801 (page 50), seems not to have received from later writers the attention it deserves:

"Dr. Wollaston mentioned [to me] a very elegant experiment for proving the dispersive power of the eye. He looks through a prism at a small lucid point, which of course becomes a linear spectrum. But the eye cannot so adapt itself as to make the whole spectrum appear a line: for, if the focus be adapted to collect the red rays to a point, the blue will be too much refracted, and expand into a surface; and the reverse will happen if the eye be adapted to the blue rays; so that, in either case, the line will be seen as a triangular space."

An observation by Wollaston, confirmed by Young, needs no verification; it is scarcely necessary to state that the experiment is elegant, and conclusive upon the point in proof of which it is presented. It is, moreover, to me, the most striking and perfect illustration of the non-achromatism of the eye with which I am acquainted, and it will, as I think, be found of value, also, as a delicate and accurate test for ametropia.

Repeating the experiment with my *left* eye by looking through an ordinary glass prism of 60°, with the refracting edge horizontal, at a bright star, a distant street-lamp, or even a very small taper flame or gas-jet placed at the farther end of a long room, I see the spectrum narrow or pointed at the red extremity and progressively wider to the extreme violet end. The triangular shape is very conspicuous, and the whole colored

space, streaked by the image of the radiating fibres of the crystalline, presents an appearance suggestive of a conical brush or pencil of rays diverging from a common focus at the red end of the spectrum. No change of accommodative adjustment alters this triangular figure except that by active accommodative effort I am able to expand it in width, so that the red end appears more or less truncated:—it is, in short, the spectrum formed by an eye *emmetropic for red rays, in its horizontal meridian.*

With my *right* eye, looking through the prism in the same position as before, I see the spectrum also widest at the violet end and narrow at the red end; but the narrowest part of the whole spectrum lies not in the red, but in the yellow, thus giving to the spectrum an appearance suggestive of a double cone or pencil of rays having a common apex in the yellow. By a slight effort of active accommodation I am able easily to change the focus of this spectrum, so as to see it as a single cone or triangle with the apex at the red extremity, and any further accommodative effort only serves to expand the whole spectrum in width, as already noticed in the case of my *left* eye. The spectrum as seen by my *right* eye, then, is the spectrum formed by an eye *emmetropic for yellow rays, in its horizontal meridian*, and therefore *slightly hypermetropic*, in the same meridian, *for red rays.*

Placing a convex glass of 144 inches focus before my *right* eye, its vision becomes practically *emmetropic for red* rays, and correspondingly *myopic for yellow*; this glass expresses, then, the measure of the chromatic aberration in my *right eye* for these two colors. So also a concave glass of 144 inches negative focus placed before my *left* eye renders this eye *emmetropic for yellow*, and correspondingly *hypermetropic for red rays.**

To measure the total chromatic aberration in my eyes, I place before my *left* eye [Em. for red] a concave glass of 20 inches

* By another method Dr. Young estimated the difference of refraction in the eye for red and yellow rays as equal to the refraction of a lens of 132 inches focus, a measurement not very different from that which I have found, viz., $\frac{1}{144}$. Dr. Young says, however: "I cannot observe much aberration in the violet rays. This may be in part owing to their faintness; but yet I think their aberration must be less than that of the red rays."—*Op. Cit.*, p. 51.

negative focus and look again at the spectrum of the point of light. All now appears changed; the spectrum is still seen triangular in form but in a reversed sense, the violet end being the apex and the red end the base. A weaker concave glass does not suffice to bring the violet end quite to a point, while with a stronger glass I can cause the violet apex to appear visibly broader, or truncated, through a voluntary relaxation of accommodation. The total chromatic aberration, then, in this eye must be about $\frac{1}{20}$.

Substantially the same value, $\frac{1}{30}$, is similarly obtained as the measure of the total chromatic aberration in my *right* eye.

This estimate, which is a little less than that given by Helmholtz ($\frac{1}{18}$), is also certainly less than the actual total aberration in my own eyes; the measurements having all been made with ordinary artificial light, which is somewhat deficient in violet rays, and in a city atmosphere always perceptibly vitiated by smoke from bituminous coal.

Exhibiting this experiment to numerous friends, I find that the emmetropes and myopes among them all describe the spectrum of the lucid point as triangular, with the apex red; the hypermetropes, on the contrary, see it with the apex violet, or at any rate with the violet end quite narrow. We have thus a direct and delicate test for ametropia, not dependent upon the recognition of letters, and one which, unlike Steiner's experiment so admirably utilized by Thomson, does not require a large pupil for its application.

In measuring myopia by this method, I have succeeded best by directing the attention to the red apex of the spectrum, the weakest concave glass, through which the apex appears as a sharp red point, being the measure of the myopia for red rays. Adding to this the correction for the brightest part of the spectrum, viz., the yellow, a correction which I have found to be about $\frac{1}{144}$, we have the measure of the actual myopia in the meridian corresponding to the direction of the refracting edge of the prism. Turning the edge of the prism then through any angle, in a plane perpendicular to the axis of vision, and again measuring the ametropia in the new meridian, we detect any difference in refraction, and by thus examining one meridian after another we may work out even very complex cases of asymmetry.

In hypermetropia, also, it has seemed to me most satisfactory to take the red end of the spectrum for observation, noting the strongest convex glass, through which the apex appears perfectly sharp, and applying the correction, minus $\frac{1}{14}$, to obtain the measure of the hypermetropia for yellow rays.

In connection with these experiments it may be observed that a red glass, excluding the more refrangible rays, ought very considerably to improve the definition of distant objects in a slightly myopic eye, provided that the illumination is sufficiently intense. This I find to be actually the case with my *left* eye [M. $\frac{1}{14}$ for yellow] in bright sunlight. So a blue glass, excluding more or less perfectly the less refrangible rays, may positively aid a hypermetrope in reading, by relieving the overtasked accommodation of a part of its burden.

The ordinary red and green lights used as maritime signals may be utilized as tests for ametropia, as I have often observed in the case of the red and green lanterns which are exhibited, in a manner very favorable for comparison, upon the tall chimneys of the Mississippi steamboats. To an emmetrope or a myope the red light appears the smaller; to a hypermetrope the green generally appears smaller than the red.

I have lately constructed a number of test-objects for astigmatism, modified from some which I described several years ago.* I refer to certain test-cards which I exhibited at the meeting of this Society in 1867, viz., perforated discs of blackened card-board, covered, on the back with thin white paper so as to present the appearance, when hung in a window, of bright lines, dots, and rows of dots showing strongly by contrast upon a dark ground. I have found these test-objects more than sufficient to detect the lowest grades of ametropia which can practically concern us, but I have found it difficult to make use of them in many cases, owing to the disturbing influence of strong irradiation. I now prefer to cover the slits or holes in the discs with fine tissue-paper, dyed red with a solution of carmine in ammonia water, and rendered transparent by Canada balsam or white varnish. By this arrangement the confusing

* Am. Jour. Med. Sciences, January, 1867, page 124. Trans. Am. Ophl. Soc'y, 1867 and 1868, page 133 and plate iii. figs. 3, 4, 5, and 6.

irradiation is avoided, and the accurate determination of ametropia in any meridian is greatly facilitated. The correction, $\frac{1}{144}$, must of course be applied to the results thus obtained, in order to arrive at the true measure of the ametropia for yellow rays. Similar perforated discs, showing lines or dots of two colors of widely different refrangibility, such as carmine and ultramarine blue (the former being a very pure red, the latter a strong violet modified by green), may be conveniently employed in repeating the observation made upon the red and green steamboat-lanterns.

Finally the experiment of Dr. Wollaston, by analyzing the chromatic aberration of the eye, suggests a double explanation of its apparent achromatism in ordinary vision. Admitting that in the accurately emmetropic eye the focus (or least circle of aberration) for yellow rays lies at the actual position of the retina, a distant point of light will be projected as a small yellow spot in the centre of a system of concentric colored discs. Of these colored discs, appearing as halos around the bright central yellow, the red and the green are pretty exactly superimposed upon the same portion of the retina, and so give rise to the compound sensation of yellow identical with that produced by the yellow rays of the spectrum. There remain, then, to be considered only the larger circles formed by the blue, indigo, and violet rays. Of these larger circles the central portions, coinciding in extent with the inner compound circle made up of the red, orange, yellow, and green rays, combine with these to make the resultant yellow appear somewhat whiter, while the outer portions of the same circles form a halo of concentric rings, shading from blue-green or blue to violet, around the brilliant yellow or yellowish-white centre. This halo is, however, composed of colors of intrinsically feeble brilliancy, too feeble, in fact, strongly to impress the retina when contrasted with the intense brightness of the yellow formed by the concurrence of the red, orange, yellow, and green rays.

Besides this physiological factor in the apparent achromatism of the eye, the experiment suggests a second, purely physical, in the radiating structure of the crystalline lens. Looking at the point of light through the prism, we observe that the successive prismatic colors are not sharply defined by any distinct

line of demarcation, but are somewhat intimately blended at their junction by lines, of varying degrees of brightness, radiating from a common point at the apex of the triangular spectrum; and it is difficult to resist the conviction that the brilliant yellow rays, thus scattered *by irradiation* throughout the area occupied by the fainter blue and violet halo, are quite sufficient to drown it in a flood of uniform or nearly uniform color.

TWO CASES OF INTRAOCULAR SARCOMA. By O. F. Wadsworth, M.D., Boston.

I. Mrs. S., æt. 28, applied to me at the City Hospital the middle of July, 1871, complaining of some pain and uneasiness about the left eye after reading or sewing. The left pupil was somewhat dilated, and there were dotted opacities on the membrane of Descemet in its lower quadrant. Iris of normal appearance; media clear; posterior portion of fundus (the only part then examined) normal; tension not increased. A slight congestion of the conjunctival vessels to the inner side of the cornea was considered as the remaining sign of a "phlyctenular conjunctivitis," which had been diagnosed by a colleague some two months before. Except some anæmia, the general condition was good. Iron, and atropine locally, were ordered.

Three weeks later only a trace of the dots on Descemet's membrane was to be seen. The anæmia was less. Atropine discontinued.

The next few weeks the eye was comfortable when not used, but after moderate use there was a prickling and dry, hot feeling in the eye, and an ache at the inner and upper part of orbit. September 2d a careful examination of the eye was made. Except one rather large vein running from near cornea toward inner canthus the external appearance was normal. T. normal. V. = $\frac{1}{2}\frac{5}{0}$. The pupil dilated well with atropine. At the inner side of the fundus, so far forward that its anterior boundary could not be made out, a small tumor, of faintly mottled, bluish-gray color, with retinal vessels running over its surface, projected into the vitreous. Near its surface were minute dotted opacities in the vitreous. The rest of the fundus appeared normal.

The patient would not make up her mind to enucleation, and I soon lost sight of her till the end of April, '72. Meanwhile she had occasional uncomfortable sensations in the eyes, chiefly in the right (the sound eye), but only after use; observed a mist before the left, and sometimes phosphenes. The vein at the inner side of the conjunctiva had increased somewhat; otherwise the eye appeared externally normal. T. normal. V.=$\frac{15}{40}$. Vessels of disc apparently normal, but the whole fundus seen as through a faint haze. The tumor had increased much, and now hid the retina to within some $2\frac{1}{2}$ disc-diameters of the nerve; on its surface were a few streaks of hemorrhage. Near it were membranous opacities in the vitreous, and at its lower edge a small separation of the retina. The field of vision showed a defect corresponding to the tumor.

She was again lost sight of till the end of January, '74. The sight failed gradually, and was entirely lost early in the spring of 1873, but the eye retained its natural appearance till the following July, when she gave birth to a child. She was quite well during pregnancy, and labor was natural, but a few hours after labor the eye became painful, reddened, and swollen, continued in this condition for several weeks and then shrank. It had since remained quiet.

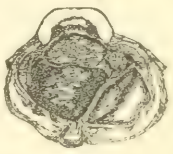
Now, the globe so much shrunken that the lids are no longer in contact with it; a groove along the outer and lower part of the sclero-corneal junction, and indentations in the course of the recti muscles; no congestion or discoloration of conjunctiva or sclera; cornea irregular in circumference, much contracted, generally clear, but with a few small, defined, gray opacities, and two or three dots of pigment near the periphery; anterior chamber but little shallower than normal; aqueous clear; iris thin and atrophied, everywhere attached to lens capsule; pupil rather large and irregular; lens cataractous. The movements of globe free; no tenderness on pressure.

As the patient now considered the eye "neither useful nor ornamental," it was enucleated February 7th, '74.

Immediately after the operation the cut surface of the nerve, $\frac{1}{2}$" behind the sclera, showed no pigmentation to the naked eye, but on dividing the eye in the horizontal meridian on the

following day, a brownish streak was seen to extend backward from the tumor along the nerve, and the microscope showed pigmented cells between the atrophied nerve-bundles. Resection of the nerve was declined.

The antero-posterior diameter of the globe was 17½ mm., the horizontal 19½ mm. Horizontal diameter of cornea 9¾ mm. Cornea and sclera were much thickened; the inner and posterior ⅔ of the cavity they enclosed was occupied by a dark-brown tumor, with large, irregular, lighter patch in its central portion; the detached and shrunken retina lay against the outer surface of the tumor. The cells of the growth were partly spindle, partly round, and contained a large amount of pigment. The lighter central portion had undergone degeneration, and consisted in large part of granular matter with free pigment granules.



II. Mr. H., æt. 32, carpenter, consulted me July 31st, 1873, on account of an affection of his right eye. Formerly the sight of this eye was good, but some five years before he had observed a mist coming before it, and had since been obliged to use the left eye in sighting along a straight line, etc., at his trade. Only within three months had he noticed, on accidentally closing the left eye, that there was no sensation of light in the right. Meanwhile there was never any pain or redness. Toward the end of May, 1873, after a day's work, he had an attack of pain in both sides of the forehead, the pain after two or three hours becoming localized in the right eye. He had since never been free from pain, at first mostly in the eye, but now for several weeks chiefly in the right side of the head. From the date of attack he had been unable to work, and had lost much flesh; for a time was about the house, then four weeks confined to a dark room; the last three weeks the pain had been less. Latterly he had used atropine locally.

Now, considerable congestion of conjunctival and episcleral vessels; upward and outward, 1‴ or 2‴ from the cornea, an oval ectasis of sclera, 4–5‴ in its long diameter; cornea slightly hazy; anterior chamber good depth; aqueous a little tinged with blood; iris discolored; pupil dilated, as when sphincter paralyzed, immovable; T. not increased. Only a dull, dark-

red reflex to be seen behind the lens. The other eye normal.

He was advised that the intraocular hemorrhage which had evidently occurred might be due either to tumor of the choroid or to some form of chronic choroiditis. The gradual loss of sight, commencing at the age of 27, in a previously healthy eye, progressing to total blindness without pain or congestion at any time, while the other eye remained perfectly normal, and, finally, the sudden large hemorrhage into the vitreous, rendered the supposition of tumor the more probable. In either case enucleation was indicated.

The eye was removed on the next day. The globe was divided in the horizontal meridian. The lens transparent and in place. The vitreous chamber contained a large amount of blood. Retina everywhere separated from choroid (perhaps in part due to opening of globe before hardening). To the outer side, a darkly pigmented tumor of the choroid lined the sclera in the form of a thin shell, reaching from the outer edge of the disc to the ora serrata. Its inner surface was smooth, except near the disc, where a small button, with roughened surface and somewhat pedunculated base, projected forward. The portion of retina which passed over the surface of the button was strongly pigmented. After hardening, the horizontal diameter of the globe was $23\frac{3}{4}$ mm.; the ant.-post. diameter 25 mm. The tumor at its thickest part (exclusive of button), 3 mm. to outer side of disc, measured $2\frac{1}{3}$ mm.; at the equator 1 mm.; at the ora serrata perhaps $\frac{1}{2}$ mm. From behind forward the tumor extended from outer edge of disc to ora serrata. From above downward, measuring along the equator, from near the vertical meridian to some 7 mm. below the horizontal meridian, about 24 mm. The portion reaching the ora serrata was some $5\frac{1}{2}$ to 6 mm. broad.

(In the cuts the lens and greater portion of the retina have been removed to show tumor better.)

The button was situated a little above the horizontal meridian; its inner edge nearly reached the edge of the disc; it measured $6\frac{3}{4}$ mm. in

longitudinal, $3\frac{1}{3}$ mm. in transverse diameter, and projected $3\frac{2}{3}$ mm. in front of the thickest portion of the main tumor.

Histologically the tumor was a strongly pigmented spindle-cell sarcoma, with considerable fibrous tissue, and not very vascular.

The second case is specially interesting from the very unusual form which the tumor assumed: very great lateral development with slight tendency to increase in thickness. Clinically it is also of interest on account of the difficulty in diagnosis it would probably have offered in its earlier stages. The button undoubtedly was of comparatively recent date. It would scarcely have been an easy task to decide the presence of a tumor from the low, even, extensive elevation of the fundus which such a growth must for a considerable time have presented, and its vascularity was so little that not much aid could have been expected from the appearance of vessels on its surface.

BRIEF REPORT OF A CASE OF PIGMENTED SARCOMA. By Wm. Thomson, M.D., Philadelphia.

In the discussion of other cases of this character, this one was reported verbally, and at the request of the society the following brief clinical history is submitted, which, although incomplete in its details, may be of interest in connection with the full reports presented by some of my colleagues.

History.—May 6th, 1872. S. L. twenty years ago was injured by piece of steel, which caused inflammation of left eye lasting several weeks, but which subsided without causing any impairment of vision. Five years ago, after extraction of a tooth, there followed severe pain in the left eye, with inflammation and a protrusion of the ball, and entire loss of sight.

Present condition.—The left eyeball is displaced downwards and outwards, and has but little motion, and protrudes so that on lifting the upper lid the ball is exposed behind its equator. The cornea is transparent, the pupil widely dilated, and the lens entirely opaque. The conjunctival vessels are distended with blood. The ball is tender on pressure, its tension is much increased, and there is no light perception. The patient seeks relief from the attacks of severe pain and inflammation which recur every few weeks, and disable him from any work.

May 8th: Eyeball enucleated; in dividing the optic nerve I was obliged to cut through a pigmented mass half an inch in diameter; found the orbit occupied by a morbid growth, which was carefully enucleated by the fingers and the handle of a scalpel, and thus removed in its capsule; it consisted of a spherical lobulated mass, larger than a normal eyeball, which was densely pigmented. The optic nerve was not involved in the mass, and it was hoped that the entire morbid growth had been

removed. No accident occurred, and the man was discharged on May 24th.

January 8th, 1873: The pain has returned; the lids are swollen. The contents of the orbit are hard on pressure, and in the cicatrix in the conjunctiva are to be seen two small black nodules.

February 19th: Has had pain down the nose and in the orbit and temple so severe every day as to prevent his doing any work.

February 28th: The pigmented nodules are doubled in size, and no doubt can exist that the orbit contains a hard mass.

With the right eye V.=½ Accommodation normal; no lesions in fundus; the disc is not choked; there is no cachexia, as evidence of involvement of any organ, nor any giddiness, nausea, paralysis, or other sign of brain lesion.

March 7th: Divided external canthus, and with the greatest care removed the entire contents of the orbit, at the apex of which a small, hard nodule was felt, which it was feared extended beyond the foramen. The pigmented mass removed was equal in size to twice that of an eyeball, and after its removal the walls of the orbit were freely washed with a solution of ℥i ad ℥i of zinci. chlorid. Wound was dressed with sol ac. carbolic, and the man quickly recovered from the operation, and was sent home March 29th with no sign of any return of the disease.

August 6th: Is looking well. Tinnitus in both ears, but hearing not impaired; slight pain in left orbit and in the head; abduction of Rt. slightly impaired; V. and A. normal.

October 28th: Paralysis motor externus of right but no change in the fundus. No choked disc; V. = ¼; pupil responsive. The pain in the left side of head has been so severe at night as to demand narcotics. He becomes giddy on stooping down, so that he is unable to resume his work. The sensation over the brow, annulled by the second operation, has returned, but there is no appearance of a morbid growth in the orbit.

To Dr. Bowen, of Bridgeton, N. J., I am indebted for the final observations, and for the opportunity of inspecting the brain, sent to me after the autopsy. The pain in the head continued, and five weeks before death there were very severe pains in both arms and legs; he gradually lost the sight of his right eye, became deaf, had severe convulsions, and was a com-

plete imbecile for two weeks before death, on May 15, 1874, just two years after first operation. No tumor existed in the orbit, nor were the internal organs affected, except the brain, which was forwarded to me. On its left side, beneath the dura mater, but attached to it, there is an oval pigmented tumor $2\frac{1}{2}$ inches in length by $1\frac{1}{4}$ inches in thickness, immediately in front of the pons, and quite near to the origin of the fifth nerve, the trunk of which is lost in the growth. The optic nerves at the commissure are normal, so that the disease must have extended by the periosteum and not by the optic nerve. The condition of the right-optic disc has not yet been determined, and will be more fully reported hereafter. The growths all presented the microscopic appearances of pigmented sarcomata.

CASE OF MELANOSIS OF APPARENT TRAUMATIC LOCAL ORIGIN.

By Arthur Mathewson, M.D., Brooklyn.

By the courtesy of my friend, Dr. Geo. K. Smith, of Brooklyn, I am permitted to present the following brief notes of a case lately seen in consultation with him, which may prove of interest in connection with the other cases of kindred nature presented.

William Rogers, æt. 22, sewing-machine carrier, five years ago received a blow from a hoop on the temporal side of the right eye, from the effects of which he soon recovered, having suffered but little inconvenience. The precise nature of the wound I am unable to state. About a year after, he first noticed, at the seat of the injury, a small, dark-colored tumor, which gradually increased, and is now about the size and shape of the small field-bean split in two. This extends along the horizontal meridan of the eye, over the ciliary region and backward, and seems to be embedded in the sclera at that point. It has never caused pain. The vision is good, and the ophthalmoscope reveals nothing abnormal in the interior of the eye. About a year and a half ago, he noticed a small tumor on the right cheek near the angle of the jaw. This was followed by numerous other tumors of varying size, from that of a large pea to that of a very large horse-chestnut, and appearing over an extensive surface—abdomen, thorax, back, limbs, and face—some of a deep bluish-black, the skin over them having undergone melanotic degeneration, others still covered with normal skin, which is movable over them. They seem to have their beginning in the subcutaneous tissue, and at first have no deep attachment. Some are now exfoliating from their external surface, but there is no proper ulceration.

The most prominent tumor unconcealed by the clothing was on the right temple, and was removed for cosmetic effect by Dr. Smith. Dr. Eno, who examined it, writes thus of the microscopic appearances:—"A small melanotic mass surrounded by connective tissue, and divided up by bands of the same.

"The pigment of the melanotic mass is for the most part disposed in the form of granules, large and small, infiltrating all the tissues of the mass, and not arranged in cells. In some places, however, there are irregular pigmental masses, perhaps cells; also there are collections of large oval nuclei surrounded by delicate cell substances of finely granular pigment-matter. These are to be found in the portions of the tumor where the pigment is least abundant. In the darker portions it is hardly possible to distinguish any structure, only an indefinite mass of pigment. The specimen presents the characteristics of melanosis, and is similar to specimens taken from the subcutaneous cellular tissue of the case previously examined by me."

There is no evidence as yet of the involvement of any internal organ, except that dark pigment-granules have been found in the urine on repeated microscopic examinations. His general health is good, and he is robust and able to follow a laborious occupation, which is the delivery of sewing machines, involving a good deal of heavy lifting.

The points of special interest in this case, to me, are the apparently local and traumatic origin at a region in which pigment normally exists (uveal tract), of a series of melanotic tumors scattered over the whole surface of the body; and also the question of the nature of these tumors, whether simply masses of pigment (simple melanosis, if there be such a thing), and only dangerous as likely to occupy vital organs and destroy life by interference with their functions, or having elements of malignacy, of a sarcomatous or carcinomatous character. The man's good general condition shows that a marked melanotic diathesis with extensive deposit of pigment-matter in the tissues is not inconsistent with life and health for a considerable period of time.

TWO CASES OF INTERESTING SYPHILITIC LESION OF THE EYE. By Charles S. Bull, M.D., New York.

The first case was an external growth involving the subconjunctival or episcleral fascia and sclera, accompanied by an intraocular growth. The patient was a woman 36 years of age, married, and the mother of six children, three of whom are living. She volunteered the statement that she had contracted syphilis from her husband, and she probably had the primary lesion about ten years ago, as shortly after that period there appeared an eruption of the skin over the whole body, though most marked on the face and chest. She was treated with mercury, and the spots gradually grew better, but have left a very distinct discoloration of the skin behind them. During the next two years she suffered from ulcers of the fauces and pharynx, alopecia and periosteal rheumatism, but her eyes remained perfectly well until seven years ago, when the left eye became very red and painful, and vision was so reduced that she had barely perception of light. She was treated in the New York Infirmary for a number of weeks, for what was probably an irido-choroiditis, and her vision improved somewhat, so that she could distinguish large objects, her right eye remaining perfectly well through the whole course of the disease. In the latter part of March of this year, the left eye again commenced to be very painful, the eyeball became very much congested, and vision again sank to perception of light. When she presented herself at the infirmary for treatment, an examination showed a general ciliary injection, a clear cornea, a discolored iris with movable pupil, and great tenderness on the slightest pressure upon the globe. The ciliary and conjunctival redness was most marked over that portion of the ciliary region lying between

SYMPATHETIC OPHTHALMIA, PERSISTING AFTER ENUCLEATION. REMOVAL OF EXTREMITY OF OPTIC NERVE AND SURROUNDING TISSUES. RECOVERY. By Hasket Derby, M.D., Boston.

C. E. B., a bricklayer, aged, 24, came to me October 28th, 1873. Three months before, while at work in the brick-yard, he had got some clay in his left eye; this accident had been followed by gradual diminution of vision, unattended by pain, and not at all interrupting his work.

On examining the left eye, I found the pupil small and adherent around its entire edge, iris discolored and bulging forward so as to be almost in contact with cornea throughout its entire extent. No ciliary tenderness. Vision $\frac{5}{100}$; projection perfect. Other eye normal.

The next day iridectomy was performed on the left eye. The wound, made upwards with a Liebreich's knife, healed readily.

November 3d: Some blood in pupil; iris on normal plane; vision as before.

1874, January 19th: Patient returned, complaining of some pain in right eye. Very slight ciliary redness was found to exist. Left as before.

29th: Rt. ciliary redness increased; pupil free; some punctated deposit on centre of cornea. Vision $\frac{20}{200}$. Left, some increase of ciliary redness with slight tenderness over site of wound.

A weak solution of atropine was ordered in right eye; and patient carefully watched.

February 10th: Renewed ciliary redness of right eye, some pain. Vision nearly, but not quite, $\frac{20}{200}$. Increase of deposit on back of cornea. Left, ciliary redness increased; more ten-

derness over wound. Vision $\frac{5}{100}$, as before. New pupil filled with membrane.

Sympathetic ophthalmia being clearly imminent, enucleation of the left eye was proposed and performed on the afternoon of the same day (February 10th), the specimen being handed to Dr. Wadsworth for examination.

"The eye, hardened in Müller's fluid and alcohol, was divided by horizontal section. Vitreous and aqueous chambers were filled with a firm whitish coagulum, showing albuminous infiltration. The retina was slightly separated from the choroid over large extent, apparently from the contraction of the vitreous during hardening. Iris attached to lens capsule. Ciliary body to naked eye more grayish than normal, and somewhat thickened.

"Microscopic examination showed the ciliary body was densely infiltrated with pus cells; its anterior processes were drawn forward and attached to the posterior surface of the peripheral portion of the iris. The iris was infiltrated with small cells, but in less degree than ciliary body; its posterior surface was attached to the anterior capsule of the lens over a very large extent. The pupil was closed by a fibrous layer containing some cells and a large amount of uveal pigment. The interspaces of the fibres of the zonula contained numerous small cells; more numerous near the ciliary processes and iris, but extending in less numbers to the lens capsule. The anterior fourth of the vitreous contained many pale cells of greatly varying size and shape. The greater portion were of the size and form of pus-corpuscles; other round cells were larger, up to thrice the diameter of pus-corpuscles, some containing two or more nuclei; others were spindle, or stellate, with long thread-like processes. Many were situated at the side of large vacuoli. In many places the cells by juxtaposition or anastomosis of their processes formed delicate membranes, which could be traced for long distances. The boundary between this portion of the vitreous and the homogeneous, nearly structureless, posterior portion was pretty sharply defined, and curved backward from the retinal surface a little behind the pars ciliaris retinæ.

"The contents of the anterior chamber were mostly homogeneous; but the anterior surface of the iris, ligamentum pectina-

tum, and a small portion of the periphery of the posterior corneal surface were lined with a thin layer of small cells. Similar cells lay here and there in small groups on other parts of the posterior surface of the cornea, but much the greater part of this surface was free, and the endothelium lining the membrane of Descemet appeared unchanged. Cornea and sclera were normal, only about some of the perforating vessels at the sclero-corneal junction there was some cell infiltration.

"The papilla was slightly thickened, as was the retina in its immediate neighborhood. Here the elements of the outer and inner granular layers were separated by œdema so as to form a series of irregular arcades, and the internal limiting membrane was thrown into folds. In the rather shallow depression near centre of papilla was a mesh-work of fine fibres enclosing some cells, and on the surface of the retina near by were also a few small cells here and there, but neither in the papilla nor this part of the retina was any cell increase evident.

"Near the ciliary attachment the retina showed some cell-infiltration and the walls of a few of its vessels in this region were crowded with cells. Elsewhere it showed little change. There was, however, almost everywhere between it and the epithelial layer a thin layer of coagulum, generally homogeneous or containing only granules of epithelial pigment, but near the ciliary body containing pus-corpuscles also.

"The choroid showed everywhere some increase of small cells, very much greater in the neighborhood of the ciliary body."

February 12th: Ciliary redness had entirely disappeared from right eye. Vision nearly $\frac{20}{20}$, the punctated deposit on back of cornea accounting for the slight falling off in this respect.

I did not see Mr. B. again until April 22d. Within a few days muscæ had appeared before the right eye, and vision begun to fall off. No pain had been felt on the other side, and an artificial eye had been worn with entire comfort. I found the ciliary redness had returned and was more marked than before; cornea a little hazy; iris discolored and adherent in several places to anterior capsule. Vision rather more than $\frac{20}{30}$. Patient was sent at once to the hospital and placed in a darkened room, atropine being freely applied. The next day the pupil was dilated ad maximum, several spots of pigment on anterior

capsule marking the previous adhesions. Redness less; fewer muscæ.

This improvement proved, however, of short duration. Two days later the iris became again discolored, the pupil contracted, and the ciliary redness increased. Two leeches were applied to the temple, and mercurials given internally. But nocturnal pain now came on, and soon became very distressing.

April 30th: The pain at night had somewhat diminished; ciliary redness daily growing more marked and forming a well-defined zone about cornea. Decided ciliary tenderness; vision daily diminishing.

May 2d: All the symptoms aggravated; increased redness and ciliary tenderness. Nocturnal pain, agonizing, extending back to ear and effectually preventing sleep. Anterior chamber deepening.

With all these symptoms of irido-cyclitis there was nothing to be found in the orbital cavity of the other side to account for the attack, either in the shape of discharge or tenderness on pressure. The artificial eye, which had never caused uneasiness, had not been worn since the commencement of the attack. The patient was now profoundly depressed, his general health beginning to give way, and the prognosis seemed gloomy in the extreme.

As a last resort, by the advice of Dr. Hay, of Boston, and my brother, Dr. R. H. Derby, of New York, and assisted by the latter, I, May 4th, carefully dissected up the conjunctival cicatrix in the left orbital cavity and removed some 3‴ of the extremity of the optic nerve and surrounding tissues. This fragment was unfortunately mislaid after the operation, so that no microscopical examination could be held.

During that night the patient was entirely free from the usual attack of pain. Within twenty-four hours the eye began slowly to improve.

May 8th: The redness was diminished, the pupil more fully dilated, and the vision clearer. There had been but a short attack of pain in the night, severe while it lasted.

May 10th: Complains of exquisite tenderness of eyeball, on awakening in the morning.

17th: Very little redness remaining, atropine omitted.

He continued to improve up to the 29th, when he left the hospital. Tension was then slightly increased, anterior chamber deepened, pupil somewhat dilated and sluggish, vitreous hazy, nerve dimly visible. Vision $\frac{20}{70}$; ciliary redness hardly perceptible.

June 11th: Pupil smaller and less sluggish; anterior chamber narrower; V. $\frac{20}{30}$.

Whether the removal of the extremity of the optic nerve, or the probable accompanying excision of a portion of the ciliary nerves, or the freeing of the latter from entanglement in the cicatrix by the necessary dissection, brought about relief in this case, we can only conjecture. The practical point raised, and one, it seems to me, of vast importance, is the following: Would it not be well, in all cases of sympathetic ophthalmia persisting after enucleation, to perform an operation similiar to the foregoing?

Note.—Unfortunately this improvement was not to last. During my absence from the city, in the summer, the patient had two attacks of inflammation, less severe than the preceding, but of the same general character. One occurred early in July, the other towards the middle of September, each lasting about a fortnight.

October 20th: Pupil slightly dilated; anterior chamber deepened; fresh deposit of pigment on anterior capsule; vitreous very hazy, allowing no clear view of fundus. V. $\frac{20}{200}$. No tenderness in ciliary region.

A FOREIGN BODY IN THE GLOBE ONLY PRODUCING SYMPATHETIC TROUBLE AFTER THIRTEEN YEARS. Dr. B. Joy Jeffries, Boston.

A man aged 42, some thirteen years ago, was cutting some kind of a spring in a rifle factory, when a piece flew and struck the right eye on the cornea, out and below, cutting through it. The patient was laid up two or three weeks. His sight held good for two or three years, then it gradually failed without any pain, and in some five months was quite gone. Since then he has had no pain till eight weeks ago, from May 6, '74, when ciliary redness was noticed and pain commenced. This has not been severe enough to prevent sleep, but "troubled the other eye." Now there is intense ciliary redness in a marked and limited zone, which, however, he says is less than it was the previous week. There is a scar on the cornea down and out, iris evidently disorganized and pressing against the cornea. The globe is hard. No pupil, and iris fastened into the old scar of the cornea. Marked sympathetic in the other eye. Enucleated May 8, '74. On section a detached, funnel-shaped retina was found. In place of the choroid a débris of inflammatory material, bedded in which was a piece of metal ¼ inch long, of the size of the point of a brad. The whole of the ciliary region massed together by recent inflammation. Placed in Muller's fluid. Sympathetic symptoms were all gone in a few days, and the patient expressed himself as perfectly relieved.

The case seemed to me to show that sympathetic trouble might not be started up until the ciliary region of the globe was implicated. The metal had lain years in the choroid, evidently causing its partial change by inflammation without affecting the other eye. When the ciliary region became affected, as shown by external redness, then only did the formerly well eye begin to show trouble, which enucleation at once relieved.

TREPHINING THE CORNEA TO REMOVE A FOREIGN BODY DEEPLY EMBEDDED IN ITS SUBSTANCE. By C. R. Agnew, M.D., New York.

M. C., æt. 30, a fireman in gas-works, consulted me on September 10th, 1873, for kerato-iritis of five months' duration, produced by the deep lodgement of an extremely small foreign body in the cornea.

Scattered over the area of the cornea were numerous cloud-like opacities, some deep and some superficial; there was marked ciliary injection, discolored, mossy-looking iris, with sluggish, irregular pupil, restrained but not fixed by three or four very small adhesions of synechia posterior.

The ciliary neurosis was very annoying, and, combined with some sympathetic irritation in the fellow eye, had for some months kept the subject from work.

Opposite the infero-nasal margin of the pupil in the cornea there was a very minute ulcer surrounded by a circular opacity. This opening led obliquely to a sinus, in the bottom of which, apparently as deep as the membrane of Descemet, was an extremely minute black foreign body. To this unremoved foreign body I attributed the kerato-iritic inflammation, as the subject remembered the fact of his having got a bit of coke or coal in his eye, and of the immediate inflammatory consequences. I attempted to remove the foreign body from the bottom of the sinus, using delicately, for the purpose, various forms of spuds and needles, but without avail. I could easily explore the sinus in the corneal tissue down to the bed of the foreign body on the membrane of Descemet, but without being able to dislodge the foreign body except at the risk of pushing it into the anterior chamber. Drs. Pomeroy and Webster

examined the case by means of oblique illumination and the ophthalmoscope, and agreed with me as to its nature, and that the very minute black speck in the bottom of the sinus was not a pigmentary product in the inflamed cornea. It was evident that enucleation was inevitable unless the foreign body could be removed. It occurred to me, as I could not remove the foreign body alone, that I might remove, by means of the trephine, the disc of corneal tissue which included it, and thus remove the cause of the kerato-iritis and of the sympathetic trouble in the fellow eye. We placed the patient under ether, held the eye under fixation forceps, and without difficulty removed a disc of corneal tissue, the exact centre of which was the opening of the sinus holding the foreign body. Although we applied the trephine perpendicularly to the corneal surface, we did not cut through into the anterior chamber so as to complete the circle at once, but so as to leave a small segment of the deep surface of the disc to be cut by the scissors. Removing the disc and examining the sinus in its centre, no foreign body could be found, as the black speck had disappeared. This speck had not dropped through the sinus into the anterior chamber, as there was no opening in that direction; it could not be found floating on the surface of the eyeball, or in the inferior conjunctival cul-de-sac, and it is not probable that it got into the anterior chamber through the wound made by the trephine, as the kerato-iritis soon subsided and the eye regained a healthy state, and all sympathetic trouble in the fellow eye disappeared. The question remains, what became of the extremely minute black speck which was seen in the cornea before the operation, and could not be found in the disc of corneal tissue removed. In using the corneal trephine it is observed that the disc of tissue which it cuts out is more or less crumpled by the rotatory motion, and reasoning upon this fact, we were led to believe that the foreign body was worked out from the depth of the sinus, and washed away unseen by the free escape of aqueous humor and tears. No prolapse of iris followed the trephining, and under simple dressing, with a light bandage, the eye soon recovered without synechia anterior.

The symptoms of kerato-iritis rapidly vanished, the cornea became much clearer except where the scar was left by the trephine.

This scar, when mature, was only about half the diameter of the calibre of the instrument. I did not feel justified, in this case, in attempting to remove the foreign body by any of the methods previously recorded, and the history of the case, followed for many months subsequent to the operation, seems to ensure a beneficent result. Although the existence of slight synechia posterior guarded this subject against the occurrence of prolapse of the iris through the wound made by the trephine, we would not hesitate to resort to the use of the trephine for the removal of a deeply embedded and immovable corneal foreign body, even though a synechia anterior might result, the danger resulting from a synechia anterior being less than that from a foreign body remaining permanently embedded in the cornea.

A NEW METHOD OF TREATING BLEPHAROSPASM.

By Arthur Mathewson, M.D., Brooklyn.

The following case is presented as illustrative of a simple method of treating what sometimes is found to be a very obstinate and troublesome affection, with the hope that it may be given a further trial, and may prove as effective as in this instance.

Miss V. B., æt. 21, has had epileptic attacks since childhood, in one of which, five months before she first consulted me, March 5th, 1874, she fell, bruising the right temple and supra-orbital region. Blepharospasm, affecting the corresponding side, came on, apparently as a result of this injury, the eye being tightly closed, and the patient unable to open it. McKenzie, in his work on diseases of the eye (London, 1854, page 181), refers to such injuries as a cause of one-sided blepharospasm—the twitching of the lids and the resistance to raising the upper with the finger distinguishing such cases from those of paralysis of the levator palpebræ, which is sometimes the result of like injuries. The eye was otherwise unaffected, and the vision was good.

On May 2d, a variety of other means having been tried without effect, and the patient and her friends being very anxious that something further should be tried, I bethought me of a plan I had seen employed by Dr. Van Bibber, of New York, in a case of ptosis exhibited at a meeting of the New York Society of Neurology and Electrology; which was, to raise the upper lid by means of a slender band of india-rubber fastened near the lower edge of the upper lid below and the forehead above with stripes of isinglass plaster and collodion. As I recollect this method had been employed by Dr. Van Bibber only in a

case of ptosis, and was not suggested as a means of relieving blepharospasm, but it occurred to me, as I raised the lid with my finger, that if it could be kept elevated for a time, the spasm of the orbicularis might be overcome, and that a slender rubber band fastened in the way indicated—which by its elasticity would yield enough to render it not unendurable, and at the same time exert a constant force in opposition to the action of the muscles—would be just the thing for that purpose. Accordingly a band of rubber, about a line in breadth, half a line in thickness, and an inch in length, was attached by one end to the surface of the upper lid, near its lower edge, at the middle of its horizontal length, a strip of isinglass plaster, notched so as to adapt itself accurately, being applied across the band, and the whole covered with collodion and allowed to dry till firmly adherent. Then the band was stretched upward to an inch and a half, so as to elevate the lid moderately, and fastened to the forehead in the same way. The band kept in place, and was borne without inconvenience for twelve days, till, during the struggles of an epileptic attack, it was loosened. The blepharospasm was then found to be entirely overcome, and has not returned.

The prompt and complete relief afforded by this simple device in a case that had so long resisted other means of treatment, seems to me to commend it to a general trial.

The size, length, and tension of the band may of course be varied to suit circumstances, and in some cases it may be found better to employ more than one band, and to act upon the lower as well as the upper lid.

Though I have as yet had no opportunity of trying these elastic bands in cases where the contrary condition exists, and instead of blepharospasm or ptosis there is paralysis of the orbicularis or spasm of the levator palpebræ superioris, I believe they will do good service in such cases, being applied so as to draw the eyelids together, and thus assisting feebly acting muscles, and antagonizing those whose action is too strong.

A CASE OF DOUBLE, EXTREMELY MINUTE, AND APPARENTLY CONGENITAL LACHRYMAL FISTULA. By C. R. Agnew, M.D., New York.

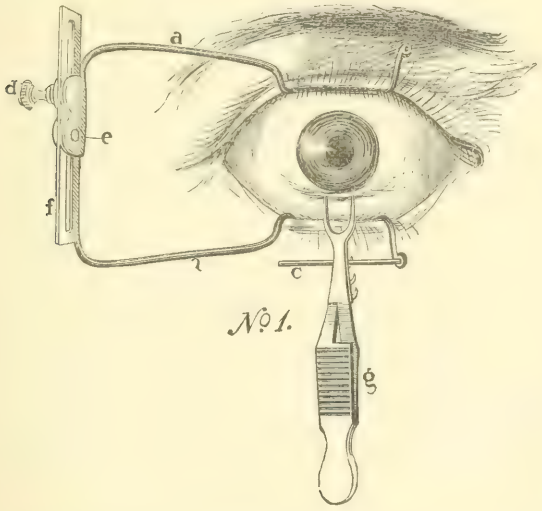
The case was that of a girl three years of age, in excellent health and of healthy parentage.

A year previously to the date of my examination, December 5th, 1873, a minute drop of clear fluid was observed exuding from the region of the left lachrymal sac at a point immediately below the tendon of Horner's muscle. Six months afterwards a similar drop of fluid was observed over the right sac. In neither case was there, or had there been, the faintest trace of inflammatory action about the eyes, or any tendency to blepharitis or catarrh. I first saw the child on December 5th, 1873, and observed its good health and entire freedom from any trace of eye disease or want of full facial development. The parts about the internal canthi were well formed, and might have been taken as models of anatomical perfection. Immediately beneath the horizontal elevation made by the tendon of Horner's muscle, and over the centre of the corresponding portion of the lachrymal sac of each eye, might be seen, on careful scrutiny, an extremely minute capillary opening, from which the merest drop of pellucid fluid would exude on pressure, or spontaneously. The margins of the fistulæ were not raised in the least above or depressed below the surface of the surrounding skin, nor were they in the slightest degree inflamed or otherwise changed in color. The little fistulæ were so extremely minute that they were scarcely to be distinguished, except when a little dew-like moisture exuded. The puncta seemed to be well formed and patulous. The parents stated

that sometimes after crying, the fistulæ would discharge tears in small quantity, but entirely unaccompanied by any local inflammatory action. I did not feel justified in resorting to any form of surgical interference, contenting myself with asking to see the case, should any change occur.

THREE NEW INSTRUMENTS:—SPECULUM, OPHTHALMOSTAT, AND TENOTOME. By Russell Murdoch, M.D., Baltimore.

Fig. No. 1 represents the speculum in position. It consists of two blades, marked *a* and *b*, the one attached at right angles to the bar *f*, and the other to an inverted saddle. The saddle rides under the bar, and has at one end a pin, around which



No 1.

it describes nearly a semicircle, carrying the blade a with it, and at the other end a screw, *d*, to fix it in position on the bar.

In adjusting the instrument, the blades are to be invariably first brought closely together and fixed by the screw, and then their distal ends inserted under the lids; by a reversed quarter-turn of the screw, the blade *a* is sufficiently loosened to

slide on *f*, but not enough to fall out of its natural horizontal position.

In pulling the lids apart, the free end of the bar, *f*, must be steadied by the ball of the most convenient finger or thumb, varying, of course, with the eye to be operated on. When the lids are drawn apart to the desired position—a feat easily accomplished—a quarter-turn of *d* fixes the blades.

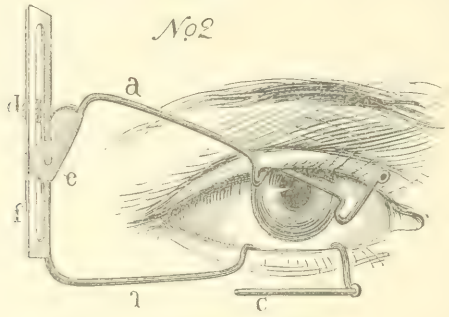
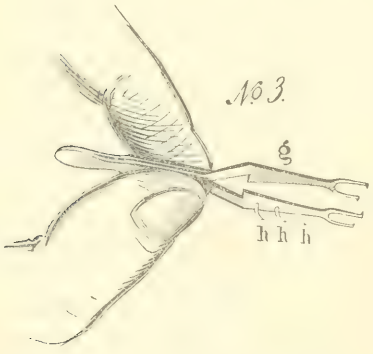


Fig. 2 shows the method by which the lids disengage themselves. The operator has only to make a complete reversed turn of the screw to find the speculum on the cheek of the patient, and that absolutely without pressure on the ball, interference with the wound, or handling of the lids.



It is hardly necessary to state that the ready disengagement of a speculum is the most important desideratum.

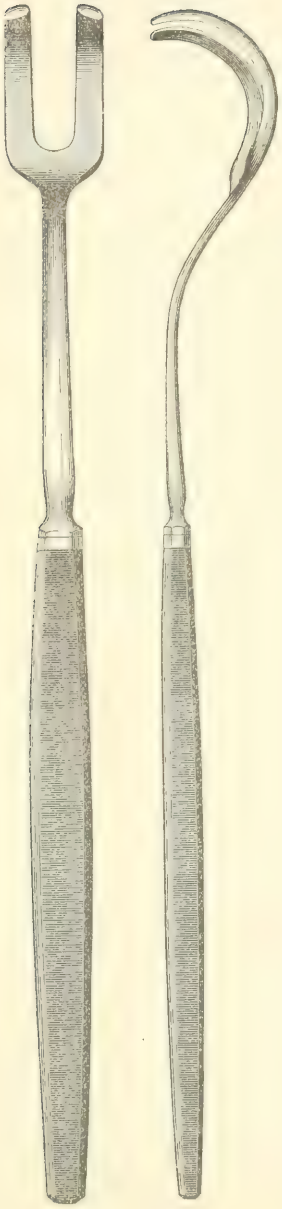
In Figs. 1 and 2, the letter *c* represents a small movable bar, an attachment which can be secured in either blade of the speculum, and is designed to retain in position an ophthalmostat.

This instrument is shown first, in position, in Fig. 1, and then side-view, unapplied, in Fig. 3. In a word, it is a pair of

crossed-branched, forked, rat-toothed, self-holding, and self-retaining spring forceps, and, as its name implies, is an automatic eye-holder. The application is so very simple, and so well represented in the drawing, as to require no further description.

The third instrument is a crochet-pointed hook tenotome Is designed to be used in any operation where the muscles are first to be found and held, and then cut, as in strabotomy.

The angle at which the blade joins the shank is 120°, an angle, in my experience, most convenient for the combined function of hook and knife. The crochet-point has been employed by a fellow-townsman, Dr. Theobald, on the ordinary strabismus hook, and designed by him to prevent the muscle from slipping off the hook in the Moofield's operation. I have added it to the present instrument in order to hunt up stray fibres, and thereby dispense with the second hook, as well as with the scissors.



INSTRUMENT FOR FACILITATING SECTION OF THE OPTIC NERVE. By G. Hay, M.D.

Having sometimes in enucleation found it difficult to draw forward the eyeball sufficiently so as to be able to sever the optic nerve at some distance from the ball, it occurred to me that the latter might be lifted with the aid of an instrument passed behind it, and for this purpose I had made a kind of two-branched blunt hook.

The branches are smooth, thin plates, so shaped as to fit the posterior surface of the eyeball. They are somewhat parallel with each other, long enough to pass about threequarters the way around the posterior half of the eyeball, and separated by an interval of a quarter of an inch, to allow the optic nerve to pass between them. They are one and a half lines broad, and at the ends flat, rounded, blunt, thin, and smooth.

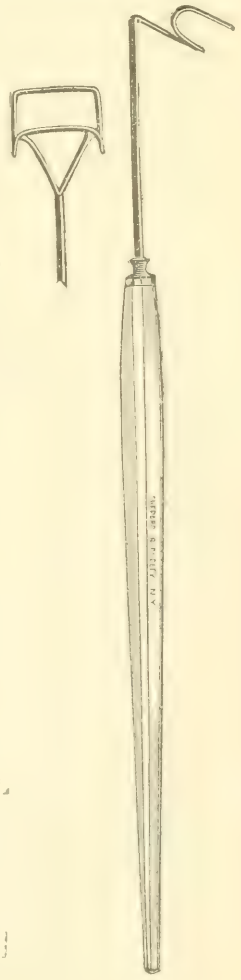
From the junction of the two plates proceeds the stem, which, at the height of about three-quarters of an inch, is bent outwards, away from the concavity of the branches.

As I have used the instrument, it was introduced from the nasal aspect of the eyeball, the two curved plates sliding easily along by the optic nerve, one on each side of it. The nerve was cut from the temporal side.

TWO NEW INSTRUMENTS.

1. A RETRACTOR FOR THE UPPER LID. (WITH WOOD CUT.) By Dr. Henry D. Noyes, New York.

When we have to deal with an eye which is deeply sunken in the orbital cavity, it is extremely difficult to separate the lids so as to get a satisfactory exposure of the cornea. We frequently meet this condition in old and emaciated persons.



Furthermore, if for any reason it is imperative not to make pressure on the eyeball when we wish to expose it fully to view, I have found it hazardous to use either the usual elevator or any form of speculum. I have commonly resorted to a strabismus-hook, with which to lift the upper lid only.

This device is, however, not satisfactory, and for a deeply set globe the usual elevator fails to give complete exposure of the eye, and no speculum can meet the difficulty, because all such instruments must rest upon and be arrested by the anterior margin of the orbit. The contrivance described and figured below has been invented to obviate the objections above alluded to. It has been devised after reflecting upon the manner in which the upper lid is lifted, viz., by being, as it were, rotated over the spherical surface of the eyeball. In other words, because in being elevated the upper lid retreats under the roof of the orbit, an effectual instrument to perform this movement must follow the lid into the cavity of the orbit. The method by which this new retractor acts is at once apparent. It catches the tarsal margin as a pen is laid in a rack, and

carries the whole lid under the orbital roof as far as may be desired. The operator's hand does not lift up the lid against the roof of the orbit, but pushes it backwards over the top of the eyeball, between it and the superior surface of the orbit. There is always room enough here to allow the instrument to be then, as it were, buried in the cavity, and no pressure need be made on the globe. The lightness of the instrument is an incidental recommendation of it. It is made of stiff wire and needs to be strong only in the shank. Its action in exposing the front of the eyeball to view is so complete that one needs sometimes to have care not to push with it too much. Unlike the common elevator, it does not press against the angle of reflection of the conjunctiva, but exerts its force upon the free tarsal edge, and hence possesses peculiar power.

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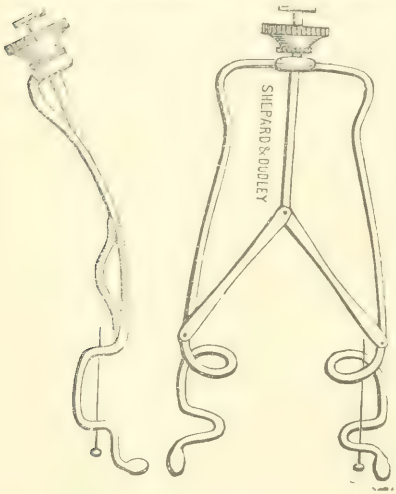
2. A FIXATION FORCEPS WHICH ATTACHES TO THE SPECULUM. (WITH WOOD CUT.)

Under many circumstances it becomes desirable to have, for fixing the eyeball, some instrument which shall not compel the aid of an assistant. Sometimes an assistant of suitable dexterity to be entrusted with this delicate function cannot be obtained. Every operator will often be glad to be enabled to perform all the manipulations about an eye with his own hands exclusively.



The instrument now presented has been devised to answer the purpose indicated; and I can confidently state that it often proves extremely useful. It is a small forceps with crossed blades and a rather stiff spring to keep them shut; it is curved in an S shape, and rides upon the lower blade of a wire specu-

lum. The double curve given to the forceps blades is intended to follow a line which, beginning upon the front surface of the lower lid, travels up to and over its tarsal border, then down its conjunctival surface to the cul-de-sac, turns again to pass upon the globe, and they seize the conjunctiva bubi near to the lower margin of the cornea. Into one of the curves the tarsal edge of the lower lid fits; the other curve receives the edge of the speculum. If about to use the instrument, slip it with closed blades into the inferior cul-de-sac. Let the lower lid fit itself into the proper curve, press the blades apart and seize the conjunctiva; at a point near to or far from the cornea as the position which is to be given to the eye may call for; then insert the speculum in the usual way, and as its blades are separated in spreading the lids asunder, the action of the speculum at the same time draws the eyeball downwards. The function of the forceps is confined to moving the globe downwards, and does not admit of much deviation sideways. There is no means provided for fastening the forceps to the speculum, but two or three notches might, if needful, be made in its blades to keep the forceps from slipping from side to side. It must be admitted that in using these forceps there is some compression of the eye. I have on this account not ventured to apply it to operations where a large wound is to be made in the cornea. But to many cases, as enucleations, small iridectomy, etc., etc., it usefully adapts itself. One merit it possesses is that the act of closing the speculum instantly relieves the pressure of the forceps, and its small size and weight prevent its doing any mischief. In its action it will be observed that the line of traction is in a tangent to the globe, and does not tend to pull off the conjunctiva, or to antagonize the instinctive effort of the eye, when handled, to retreat back into the orbit. An experience of eighteen months enables me to speak favorably of this contrivance.

As an addendum to the above remarks, and in the same line of suggestion, I may state, that to keep the cornea turned outwards as in an operation for converging strabismus, without calling upon an assistant for help, one simply needs to separate the

lids with the usual speculum, to attach an ordinary spring-catch fixation forceps to the eyeball in front of the insertion of the rectus externus, and after drawing the eyeball outwards to the point desired, let the forceps fall down over the temporal edge of the orbit. Provided the patient is well under the influence of an anæsthetic, and lying on the back, the eye will maintain the everted position until the finish of the operation—the weight of the forceps will be sufficient to hold it steady.

CASE OF HERPES ZOSTER OPHTHALMICUS. THE WHOLE SIDE OF NOSE INVOLVED WITHOUT AFFECTION OF THE EYE. By O. F. Wadsworth, M.D., Boston.

A little girl, 4½ years of age, suffering from an attack of herpes zoster ophthalmicus, was referred to me at the Boston Dispensary, by my friend, Dr. B. F. Greenough, Nov. 14, 1873. The mother stated that she had first noticed complaint of pain, and soon after a "pimple" at the root of the nose, about a week before.

When I saw her there were numerous rather deep ulcerations, some of them covered with thick crusts from beneath which pus oozed. The ulcerations were situated on the right side of the forehead and front part of the hairy scalp, the upper lid, and the whole side of nose to the tip. There was no affection of the nasal mucous membrane. The upper lid was swollen and closed. On raising it with an elevator, the conjunctiva of the globe was found much congested, but without chemosis; the cornea and iris clear and bright.

The mother did not bring the child with any regularity, and I saw her only once again during the course of the disease, about a week later. The condition of the skin was a little better, the lid still swollen, the cornea and iris normal.

The first part of April, 1874, I visited the child at her home. There were large cicatricial pits on the right site of forehead and root of nose, rather smaller and more shallow ones, but still marked, on the upper lid and extending down the side of nose to the end. The eye was perfectly normal in appearance. The mother stated that the whole duration of the disease was about three weeks.

It was impossible to obtain the history of the case with as much accuracy as desirable, on account of the youth of the patient, the ignorance of the mother, and her neglect to bring the child as directed. Still the fact of a well-marked eruption of herpes zoster on the side of the nose without affection of the eye was established.

It has been laid down as a clinical rule, and never to my knowledge contradicted, that when the whole side of the nose is affected in this disease, the eye does not escape. The explanation is found in the fact that the same nerve (naso-ciliary) which supplies the lower part of the skin of the nose and the nasal mucous membrane, supplies also the long root of the ciliary ganglion and long ciliary nerves, and so the cornea and iris.

The case reported forms an evident exception to the rule. The eruption was present to the tip of the nose, yet the eye did escape. The mucous membrane of the nose was also unaffected. The latter circumstance would go to show that the naso-ciliary nerve was not involved, and this granted, the supposition of a variation in nerve-distribution would readily account for the anomaly. This supposition is probably correct, for Professor Turner has reported (*Journal of Anatomy and Physiology*, November, 1871) just such a variation as would be required. The frontal nerve gave origin to a long, slender, infra-trochlear branch, which passed below the pulley of the superior oblique muscle, to be distributed along with the infra-trochlear branch of the naso-ciliary nerve.

SIX CASES OF HERPES ZOSTER OPHTHALMICUS. WITH REMARKS. By Dr. B. Joy Jeffries, Boston.

HERPES ZOSTER OPHTHALMICUS. CASE I.

A lady aged 55, after exposure to a continued cool wind against the right side of the head, in driving in the evening, felt, August 31, 1873, a pain in the corner of the right eye, "like a needle." She went to bed and finally to sleep. The next day there was more pain, and hot applications were made. By the third day an eruption appeared, and the lids were swollen so as to close the eye; the conjunctiva was inflamed. The disease occupied the right side of the scalp to the occiput, the forehead, brow, lid, and side of the nose to the tip. The crusts began to come off in three or four weeks, and were very extensive. Crusts also came from inside of the nose on that side. By the sixth week the skin was healed up. I saw the patient in the eighth week, October 25, 1873, and found scars on the brow to the outer side, from there to the root of the nose, down the side of it and at the inner angle of the lids. These scars are not pitted, *i.e.*, below the surface, but red and raised like *keloid*. There is some conjunctival trouble, with tears and slight secretion. Some small vesicles on inside of lower lid towards inner canthus, also on the globe above the cornea. There is great intolerance of light. Vision, so far as could be told, about as good as the other eye. Seemingly no *iritis* or *keratitis*. The patient was fairly worn out with the attack of ophthalmic shingles, she had lost flesh, and was weak and depressed. No atropine had been used. This was ordered: grs. ij to ℥ j. *bis die*. Over the skin, to be painted, chloroform one part to five of sweet oil, citrate of iron, and quinine grs. v. *bis*

die. By eight days, November 2, 1874, patient has found great relief from the local application to the skin, and slept quite well. She says it "cools the skin and lets the eye open easier." The atropine did not irritate the conjunctiva. The scars are much less red. The vesicles on the inner sides of the lids are not so troublesome. Vision in each eye without glasses equal $\frac{2}{7}\frac{0}{0}$. I succeeded in making an ophthalmoscopic examination, which was borne quite well. The pupil was well dilated, and there was no iritis. The papilla and whole retina were quite red from injection. A proper test gave me Hm. with V. equal 20—30 with $+\frac{1}{3}\frac{}{0}$. Treatment continued.

November 21, 1874: The patient has no "lasting real pain," but occasional darts through the eye. There is still sensitiveness to light, and occasional vesicles on inner side of upper and lower lids. She has gained flesh and appetite. The affected eye has vision equal 20—60 with $+\frac{1}{3}\frac{}{0}$. Atropine and pill continued once a day, and cutaneous application *pro re nata*. She complains more especially of excessive itching of the skin.

December 7, 1873: This has continued, and there have been continued crops of vesicles on inside of lids. From the known action of calomel in phlyctenular ophthalmia, this was directed to be dusted on at night, and atropine solution in the morning. Some dots were now seen in the cornea, like interstitial keratitis. Local and internal remedies as before.

December 30, 1873: V. O. D. equal $\frac{2}{3}\frac{}{0}$, without glass. V. O. S. with $+\frac{1}{3}\frac{}{0}$ equal $\frac{2}{2}\frac{0}{0}$. The vesicles on the inside of the lids look flat and firm. Itching over brow and lid severe. Treatment continued.

January 18, 1874: V. O. D. equal $\frac{2}{4}\frac{0}{0}$, without glass. Itching still persists, more especially morning and evening, and now only occasionally darting pain through the eye. Cornea deposits or spots less, with improved vision. The ulcers from the vesicles better, less of a yellowish-color than they have had, and filling up. Continue calomel insufflation, and quinine alone internally, grs. ij. Patient says the side of her head feels "unnatural."

January 29, 1874: Patient said she had last night a piercing sudden pain deep in the eye for a few seconds, startling her considerably. The ulcers on lids are healing. There is a pig-

mented spot on the sclerotic up and in from the cornea. Light is much better borne. Itching something less. Treatment continued.

March 1, 1874: Darting pain less often. Some scattered herpetic-like pustules still on inside of upper and lower lids; they are not so deep. All are not new ones. V. O. D. with $+\frac{1}{12}$ equal $\frac{20}{30}$. Tonic continued. Patient had a touch of sciatica. Bears light better and cold better. Itching "like that of chilblains." Local application continued. The vesicles, or rather their bases, less deep. Some new ones. Calomel powder stopped and tannic acid, ℈ j. to glycerine ℈ j. used instead. I heard by note that this produced considerable pain, and it was stopped and calomel continued. Still some spots in the cornea. Ophthalmoscopic examination shows retina and nerve more natural. The seats of vesicles healing and showing marked yellow color. Simple cerate ordered.

May 6, 1874: Corneal spots much faded. Vesicle seats healed and filled with yellowish cicatricial tissue. Patient still complains of much itching. All the symptoms are better, and patient in much better physical condition. Tonic continued, as also calomel. Patient's husband reported she was much better, the latter part of June, 1874.

HERPES ZOSTER FRONTALIS. CASE II.

A gentleman, aged 32, had undergone excessive and fatiguing work in a new business. Without any apparent, or at least recollected, exposure to cold, there occurred over the region of the frontal nerve, in the scalp of the right side, excessive smarting and pain, followed by groups of "red, fiery pimples which stung like a coal of fire." These he attributed to or connected with a previous injury, to be presently mentioned. There were none on the brow, lids, or side of the nose; the eye also escaped. The subsequent crusts were ten to fourteen days in coming off, and it was some three weeks before he was through with the whole attack. When the patient was a lad, sixteen years previously, he was holding a screw-driver vertically near his face, turning in a screw under a vehicle. The instrument slipped, and the end struck him under the edge of the right upper orbit in the

track of the frontal nerve. It caused considerable pain there, and radiating over that side of the scalp. Since then he has had frequent neuralgic-like pain in the locality, and at times the skin itself positively tender to the touch. He had always mistaken the frontal notch for an injury then done to the bone, and supposed this attack of frontal shingles to be due to it, on account of the occasional neuralgia. Now, three years since this attack, he has quite marked scars over the seat of the ulcers, especially high up on the forehead. They are so noticeable that his friends, during the recent epidemic of variola, insisted that he had been a victim. The patient's mother had a severe attack of shingles, with which disease, from observation of other cases, they were rendered familiar.

HERPES ZOSTER OPHTHALMICUS. CASE III.

A gentleman, æt. 45, Sunday, March 8, 1874, after previous exposure to considerable cold, felt a sharp pain at the inner corner of his right eye, as if something had got into it. By Monday morning there was redness of the lid, increasing that and the next day. The patient, however, was able to keep about. Wednesday the redness extended over the head, occupying pretty thoroughly the track of the frontal nerve. The lids were so swollen as to close the eye. The eyeball escaped. There was no eruption down the side of the nose, but on it, just below the level of the inner canthus. The upper lid had on it what the patient supposed to be a stye. The pain was not very severe at any time, but the whole was very uncomfortable. Besides this, pain was felt over the side of the face up to the meridian line, quite graphically described as a "feeling of that half of the head being all wrong and sick." The irregular pustules left thick crusts at inner corner on the nose, on upper lid near the edge, on the eyebrow and forehead, and smaller ones scattered over the scalp back to the occiput on right side. The gland behind the right ear was swollen and tender, but did not suppurate. Five and a half weeks after the attack, there are more or less well-marked scars on the seat of the above-mentioned crusts. The patient complains of no trouble now. I am indebted to my colleague, Dr. Hay, for permission to gather these notes from the patient himself.

HERPES ZOSTER OPTHALMICUS. CASE IV.

A man aged 63, a night-watchman in a store, about fourteen days previous to March 15, 1874, began to feel a sensation as if "a fly was on his head." By the next day he had pain over his eye, and considerable swelling the next two days. On the third and fourth day the eruption was noticed by his family, and by this time the lids were swollen to his nose. At the end of the fourth day the parts affected were all red and swollen and broken out in sores. The pain was severe enough to prevent sleep. I saw him on the twelfth day. On the quite bald scalp on the right side, limited to the distribution of the frontal nerve, are five scattered crusts, as far back as the nerve goes. On the forehead and brow, quite to the outer side of the frontal nerve, is a group of heavy crusts on a deep-red cutaneous surface. This was still there the fourteenth day, and a blush yet seen over the scalp. The lids continue swollen. There has been no eruption on them, or on the side of the nose, and the eyeball had escaped. There is distinct difference of sensation on the two sides of the head. Cold affects him severely, but itching is only what he especially complains of. Treatment consisted of local application of chloroform and sweet oil, and quinine internally. The patient sent me his photograph, which I had asked for, and, not appearing again himself, I judge treatment was of service to him.

HERPES ZOSTER OF UPPER LID. CASE V.

Monday, September 30, 1872, a girl aged 13 applied to me, saying that her left eye had been bloodshot from the previous Thursday. By Sunday she had seen and felt a group of the vesicles occupying the inner third of the left upper eyelid. They smarted and stung, and were well-marked vesicles with some swelling of the skin. By the next day I found them more or less confluent, forming a thin crust. The disagreeable symptoms were about gone.

HERPES ZOSTER OF LOWER LID. CASE VI.

September 11, 1873, a lad, aged 17, presented himself with a group of herpes zoster just below the right lower lid, an inch

in diameter. The vesicles were large, situated in a reddish base, and the part painful.

Ophthalmic shingles is now so frequently diagnosticated and reported, that perhaps an apology is due in presenting these cases. Each seems to me, however, to have some special point of interest, either in itself, or as illustrating our present knowledge of this very curious affection.

In the first case of the lady who suffered so severely, the scars, as I said, were not pitted, as we usually see, but *raised* and *red*, looking very much like *keloid*. I look, however, to their absorption and sinking below the surface. As seen for some months after the attack, they never would have been taken for scars of shingles. I have never before seen such continued formation of vesicles on the inner side of the lids and in the globe, or such persistent ulceration of the original vesicles which came there with the cutaneous eruption. All the cutaneous ulcers had long healed, and I was puzzled how to treat these annoying *ulcers*, which they fairly were. They would not bear any even weak stimulation, as from zinc or tannin. As calomel in powder acts so well in phlyctenular ophthalmia, I used it freely. It certainly did no harm, and I think was of benefit. This ulceration was deep into the cartilage, as shown by the yellow color I speak of, and the final yellow cicatrices. This may, perhaps, explain the tardy filling up with new growth.

In case 2 the quite certain injury of the frontal nerve may have been an exciting cause. Only the cutaneous tract above the notch and point of injury was affected. Whilst patients can so often fix on, and speak themselves of, some decided exposure to cold previous to an attack, this gentleman knew of none. The frontal nerve in its cutaneous distribution had been in a constant state of irritation, if I may use the word, since the injury, sixteen years before. There were frequent neuralgic pains and absolute tenderness to touch.

In case 3 the amount of pain and suffering was quite inconsiderable compared with the extent and duration of the attack. The peculiar pain and discomfort over the whole of the head and face on the affected side was something unusual. It may have been due to or connected with the swollen and tender gland behind the ear, which, however, did not suppurate.

In case 4 the patient, aged 63, was lucky to escape with so little persistent pain and itching. The crusts and scars in the eyebrows were quite to the outside of the nerve. The photograph shown, rather tends to conceal than render this evident.

In cases 5 and 6 we have instances of very evident attacks of zoster over the cutaneous distribution of but a small twig of the nerve. I think, however, they would have been found associated with or dependent on a partial and of course minute interference with nutrition or inflammation of the Gasserian ganglion, since simply *portions* only of the ganglion have been affected.

The irregular distribution of even ophthalmic shingles, and its not following the laws framed for it by a very large majority of the cases reported, may be explainable by abnormal nerve distribution. The implication of neighboring parts and encroachment on other tissues may also be due to variations in nerve connections and distribution. I would call attention to these variations as given at page 130 in the "Handbuch der gesammten Augenheilkunde," by Merkel, who has collected, and comments on, all reported variations in connection and distribution.

TREATMENT OF CASES OF HERPES ZOSTER FRONTALIS BY ELECTRICITY.

ARTHUR MATHEWSON, M.D., Brooklyn.

Case I is of special interest, as forming an exception to Hutchinson's rule, that "whenever the side of the nose, *to its tip*, shows vesicles, the eye inflames severely." The patient, Dr. J. C. Shaw, late House Surgeon of the Brooklyn Eye and Ear Hospital, æt. 27, of good general health, was much exposed while driving, January 1st and 2d, 1873, and was struck on the right eye by a piece of snow on the 2d.

January 3d: He noticed a darting pain in the right eyeball coming on at intervals and lasting but a few seconds.

January 4th: The pain continues, but there is nothing abnormal in the appearance of the eye or surrounding parts.

January 6th: A slight conjunctival injection appears near the inner canthus.

January 9th: A little red spot at the inner part of the right upper lid first suggested the idea of approaching herpes zoster, to account for the continued and increasing pains which now began to radiate over the forehead. The following day left no doubt on this point, for a well-marked characteristic eruption appeared about the root of the nose and at several places on the right side of the forehead and top of the head.

January 13th: The *eruption has extended over the side of the nose so as to almost cover it, even to the tip. The eye shows nothing more than some conjunctival injection. The cornea is perfectly clear, and the iris slightly, if at all, affected.* Both lids are partially covered externally with eruption, and somewhat swollen. The pain has been at times intense, affecting the eye itself, and the orbit more than the forehead, and only

relieved by subcutaneous injections of morphine, until yesterday, when the galvanic current was tried with marked effect in mitigating the pain. From this time he used the battery freely at his own discretion, to the great relief of his sufferings and the apparent hastening of recovery. Quinine was used in large doses, and veratrine ointment applied locally.

January 15th: The pain has entirely ceased, and the eruption is on the wane. The case progressed favorably, and the patient was left in good health, the eye unaffected, no neuralgic pains, and with but few scars, one of these very near the tip of the nose.

Case II.—Henry Archibald, æt. 60, blacksmith, came to Brooklyn Eye and Ear Hospital, April 23d, 1874, with herpes zoster affecting right side of forehead. Ten days before, severe pain came on, which lasted a week before the eruption made its appearance. The right side of the forehead and the upper lid of the right eye were covered with vesicles and much swollen, so that it was difficult to separate the lids sufficiently to see the eye. The conjunctiva was injected and chemotic, but the cornea and iris were not affected. The vesication did not on this day extend down the side of the nose. The galvanic current was applied by Dr. G. M. Beard, to the immediate and almost complete relief of the pain, which had hitherto been intense. No other treatment was employed except tonic doses of the citrate of quinine and iron.

April 24th: There has been no severe pain since the application of the galvanic current yesterday. Some small young vesicles have appeared on the side of the nose, but do not extend far down. Local galvanization was repeated. The case progressed favorably from this time under continuance of the same treatment. The small vesicles on the side of the nose soon dried up as if aborted. Except for occasional neuralgic pains, which still continue, the eye was left in perfect condition, and the scarring of the forehead is less than I anticipated from the degree of vesication.

Case III.—Mrs. E., æt. 30 (Circa.), a patient of Dr. L. D. Bulkley, seen May 31st, 1874, by courtesy of Dr. Beard,

who was treating the patient by local galvanization. The eruption extended over the right side of the forehead, the eyelids of that side, and the right side of the upper lip. The side of the nose was not affected. There was conjunctivitis, but no other affection of the eye. The pain had been intense, but was greatly relieved by the galvanic current, which was at first applied twice a day. The patient made a good recovery under this treatment.

Case IV.—Charles Rodgers, æt. 28, watchman, a robust, vigorous-looking Irishman, came to the Brooklyn Eye and Ear Hospital, February 24th, 1873, with history of pain in right eye beginning four days previously, and after two days extending over the right side of forehead. There was nothing in the appearance of the eye to account for the pain, there being only slight conjunctivitis present. On close inspection vesicles so minute as easily to escape notice were found scattered over the right side of forehead and upper part of lachrymal sac. The minuteness of the vesicles was the most peculiar characteristic of this case. The pain was mitigated by the employment of local galvanization, and the patient disappeared after a few days.

The local galvanization, which was so successful in relieving pain and apparently in modifying other symptoms in these cases, was suggested by the good effect which my colleague, Dr. Prout, had obtained from its use in one of his cases.

Case V.—Edward H. Rowley, æt. 18, salesman, of good general health, was sent for my inspection, March 25th, 1873, by Dr. D. A. Dodge, of Brooklyn. Four days previously, pain began in supra-orbital region of the left side, and extended down the side of the nose. This continued two days. On the third day he first noticed an eruption at the root of the nose on the left side. This afterward extended over the left side of the forehead, but did not go downward over side of nose. The trouble about the eye was limited to some swelling of the lids and slight conjunctivitis. The patient suffered a good deal of pain, and was left with a deep cicatrix nearly half an inch in breadth, extending like a band across the forehead near the

median line. No other sequelæ. Galvanic current was not used in this case.

Case VI.—Mary Murphy, æt. 12, came to Brooklyn Eye and Ear Hospital, September 6th, 1871, with herpetic eruption on the left side of the forehead, some conjunctivitis, and history of pain for several days and nights. This patient soon disappeared, and the hospital record of her case is imperfect.

CANTHOPLASTY: A CLINICAL STUDY. By H. Althof, M.D., of New York.

In submitting the chapters on diseases of the conjunctiva and cornea, as found in the text-books, monographs, or journal articles of the present day, to a careful revision, and comparing whatever new or clinically useful has been said about them during the last fifteen years with the progress made in other branches of Ophthalmology, we cannot deny that, in spite of much time and labor spent, a proportional advance has by no means been made in this subject.

Follicular trachoma is at this moment just as much a real plague of mankind as it was years and years ago. Its rapid spread through hospitals, military depots, prisons, schools, factories, etc., etc. Its obstinate resistance to even the most careful and consistent treatment, the constant relapses leading so often slowly, but with frightful certainty, to ultimate destruction, and the suffering it causes the patient, have all earned for it the reputation of the most nefarious of conjunctival affections. Its literature might fill a respectable library, and it is true that our knowledge of its anatomical character has, during the last twelve years, been materially advanced, thanks to the researches of English, German, and Dutch authors. But as far as the therapeutic means at our disposal are concerned, the laws laid down by Graefe in 1856 still hold good. Says this greatest of all clinical observers: "It is exclusively to caustics that we owe the good results we see in the treatment of trachoma, and only to a careful selection of those agents, to their discreet application in regard to energy and frequency, must we look for still better ones in future. But no matter to what nicety and precision we may be able to carry their use,

one fundamental principle will hardly ever be shaken: the caustic must never be applied with intention to destroy the so-called trachoma follicles; it must only irritate them, and by such repeated irritation produce changes in the diseased tissues, which will either lead to total absorption, or at least to such a state of things in the affected membrane, that the nefarious consequences of vascularization of the cornea are prevented, stopped, or paralyzed." The chief representatives of this class of remedies are nitrate of silver in substance, solutions or combinations with nitrate of potassium and the sulphate of copper; and if we add to them the application of water of different temperatures, the inoculation of blennorrhœa or circumcision of the cornea for the most desperate cases, coupled with such internal remedies or dietetic rules as circumstances may require: we then have the whole of the treatment of trachoma of the present day. How unsatisfactory it is, every one knows who is familiar with great institutions making the study of eye diseases a specialty, or with blind asylums and houses of refuge which offer shelter to the victims of granular lids.

The next disease to which I have to call attention is diphtheritic conjunctivitis, by far the most dangerous of all external ophthalmiæ, but fortunately also very rare; so rare, indeed, that its existence in New York in the genuine form was at one time positively denied. I am sorry to say that since then we have seen more of it than we wished. All over the world oculists still look upon Graefe's famous article in 1854 as the classic picture, neither has any better mode of treatment been proposed than what he there laid down.

But how very little have local depletion, the constant use of iced compresses, most energetic use of calomel, the best of diet, etc., etc., done to arrest the destructive march! And what confidence can we put in them for the future, since we have learned that the characteristic infiltration which we sought to relieve thereby, because of the dangerous pressure from the swollen lids on the ball, and in the change of circulation following it, is due to invasion of those lowest of organizations, called bacteriæ, which care neither for the fire of the strongest chemical reagent nor the ice-bath continued for days and weeks? Before the year 1869, I have never seen but one result

in typical, genuine diphtheria: destruction. I therefore believe that we shall have to put more faith in mechanical means which may be able to diminish the pressure leading so rapidly to mortification of the cornea.

There is no conjunctival disease of a serious nature which offers to the oculist better chances of success than *blennorrhœa* in its different forms; simple blennorrhœa, whether acute or chronic, with or without deep-seated changes of tissue, gonorrhœal ophthalmia, and ophthalmia-infantum, are foes whom we may in most cases expect to conquer, if they only have not been allowed to go too far. Graefe's expression of an "almost always victorious" treatment is well chosen. Here the recommendation of cold water and the caustic is as old as the first description of the disease: the last fifty years have only defined their indications more strictly, and advanced some very subtle but very valuable modifications in their use, without in any way altering the principle. But even the most careful and skilful physician will find cases baffling all his efforts, and of such virulence that his therapeutics work far too slow to prevent the saddest consequences.

The class of conjunctival affections which I have to mention now, and on which I beg leave to make some more detailed remarks, is one of particular interest, both on account of the frequency of its occurrence, the violence of its attacks, and the frequency of relapses, and because of the different opinions expressed in regard to its pathogenesis. I refer to what is called scrofulous, strumous, or lymphatic conjunctivitis, herpes of the conjunctiva, or with a more modern term, phlyctænular conjunctivitis resp. keratitis. The great majority of physicians still believe in a vicious diathesis (dyscrasia) as the cause of the trouble, and nowhere have I found the plain statement, that a general disease of the blood has nothing to do with the form in question. There can be no doubt that it proves more violent and more obstinate in scrofulous individuals than in the healthy, but that is a different thing altogether. In itself, phlyctænular conjunctivitis must be looked upon as a purely local trouble. Let us take a very common and very bad-looking case: we find the lids more or less swollen and glued together by thick crusts. They cannot be opened without the

most violent protest of the little patients, who try with all their might to shield themselves against the faintest ray of light, by burying their faces deep in the pillows of the bed. After opening the eyes, which I have often been obliged to do under ether, we find the conjunctiva deep-red and infiltrated, particularly the *cul-de-sac*, with numerous superficial losses of substance, or small grayish ulcers producing a moderate amount of thin muco-purulent secretion,—cornea generally intact in the centre, but showing at the periphery a quantity of small bluish protuberances or open excoriations. The head and face are covered with brown or yellow crusts, which, when removed, expose the swollen, easily bleeding cutis. The mucous membrane of the nose a prey to chronic inflammation from a simple catarrh to a most offensive ozena, the alæ nasi thickened to thrice their normal circumference; nostrils closed by hard crusts, almost in contact with the massive, puffed, and cracked upper lip: the concha of the ear changed into a shapeless, encrusted mass; copious discharge of yellow or greenish matter from the external auditory canal: glands of the neck and chin painful and hard, or already softening and filled with pus: general condition miserable; no sleep, no appetite; in the majority of cases obstinate diarrhœa with more or less emaciation. This is the picture of a case that will at once be claimed as "scrofulous," and treated accordingly. But if the physician would only once call at the house of the patient, and look at the hygienic conditions under which such children usually live, he would easily see how unnecessary it is to call in "scrofula" in order to explain the state of things. In most instances he will find the child in an overheated, badly-ventilated room, of course on the bed, its face buried in feather pillows, which it holds over its head with a frantic effort against any attack of the mother or physician. The exposed occiput is covered with eczema in all its states, from the simple eczema rubrum to the ulcerating form, produced in the first instance by the heat of the pillow on which the child slept. The profuse and constant perspiration has irritated and macerated the soft epidermis; the child at once began to scratch, and every one who sees a good deal of small children, knows that even the youngest baby scratches with a marvellous skill and energy, not with its hands

alone, but by throwing the head backwards and sidewards, rubbing it against everything within its reach, and never stopping till the small vesicle, the first state of eczema, is destroyed, and a small loss of substance produced, which is covered by a thin crust. As soon as the latter is noticed, the child is kept doubly warm; the process repeats itself, grows in extent and intensity, and in a few days destroys the epidermis over the whole cranium, goes over the forehead to eye and nose, and down the side to the ear, causing at once an almost absolute sleeplessness, followed by loss of appetite and digestive troubles. Weeks pass in this way, without proper advice being looked for, and only when the whole store of patent medicines and nostrums internally and externally has been exhausted, the patient is brought to the dispensary in a truly pitiful state. If the physician at once protests against the feather pillow and hot rooms, and insists upon fresh air, the most scrupulous cleanliness, frequent bathing, good food given at regular hours, if he treats the eczema in the well-known old way, and the eyes as he would a common but aggravated conjunctivitis, he will find out quick enough that he needs neither cod-liver oil, calomel, nor sulphur auratum to see his charge recover. But after getting well once, it is well known how often relapses set in, and against those we have so far been almost powerless.

These remarks on the present state of treatment of the most important conjunctival affections show clearly that it is yet a grateful task to pay some attention to their therapeutics, and when, over eight years ago, I saw for the first time a very striking result from a proceeding not yet methodically employed, I remembered the following words of Graefe: "We do not only advance therapeutical science by searching after entirely new forms of treatment, but just as much by submitting in a strictly empirical way to a close investigation those of them which have hitherto lacked a firm basis. It is particularly the duty of all colleagues who have a very large material at their disposal, to work in this direction, and try by a great number of carefully observed cases to sift facts from deceiving accidents. Joint activity alone can separate the chaff from the wheat in the overloaded granary of ophthalmological therapeutics."—*Archives*, vi. ii. 122.

Starting from the point of view that it would be desirable to diminish or paralyze the pressure of the lids on the eyeball in a very large number of conjunctival diseases, I found that so far three proceedings had been employed to achieve the object in view. The first is the excision of pieces of conjunctiva. Graefe himself looks upon this procedure as useless in the majority of cases. It may, and often does, produce a temporarily remarkably favorable result, but this is generally and quickly paralyzed by the tendency of the wound to form luxuriant granulations, or by the formation of deep scars, which again give rise to irritation and vascularization of the ball itself, seriously impeding the free use of the organ for the future.

The second method consists in cutting out an oval part of the palpebra itself, leaving the wound to heal by granulation. I have often tried it without seeing more than a very passing relief, and then only as far as the upper lid is concerned.

The third and far the most important is the simple slitting of the outer commissure involving the skin, cellular tissue, and superficial layers of the orbicularis, without opening the conjunctival sac. The angular palpebral artery is invariably cut, and a very copious hemorrhage follows, which used to be considered the principal source of the good results observed. But even this procedure, by far the most effective of the three, gave only momentary although excellent results; so the idea suggested itself to make them permanent by modifying the operation so as to prevent the quick healing of the parts separated. It is an easy matter to accomplish: the cut is made deep enough to open the sac, and the conjunctiva is united to the skin by 3–5 sutures. It is the operation long known under the name of Canthoplasty, recommended principally for the treatment of blepharophimosis and also tried in various conjunctival affections (Graefe, Pagenstecher, Sämisch), without having ever been methodically put to a severe test. The latest remarks on the subject which I have been able to find in literature, are contained in an article of W. Wagner's, (Zehender's *Monatsblätter*, Februar–März, 1874), criticising Dr. Ryder's review of Dr. Schmid's report of the proceedings in the eye department of the city hospital at Odessa. Wagner gives us clearly enough

to understand that in his eyes Schmid has done "tarsotomia" in a great many cases without proper indications, and I am very much inclined to share his opinion,—but on the other hand believe that so far canthoplasty has been decidedly underrated in efficiency on account of want of careful trials on a large scale. The experiences of a great many friends of mine, and my own, dating back to the year 1865, have made us look upon this simple procedure as a valuable contribution to our therapeutics.

I. Trachoma.—Most of the cases operated on have been those of follicular trachoma in all its forms and different stages, from the fresh acute state, with only copious lachrymation and intense photophobia, to the severest chronic, with almost total destruction of conjunctiva, fleshy pannus of cornea, or even formation of staphyloma with absolute blindness. The indications were either to avert the danger to vision or to relieve suffering where sight had been destroyed. I have on record 400 cases thus treated during the last 7½ years,—not by any means the whole number which I have done myself, or which I have seen done by friends, but fully sufficient to entitle us to give the procedure a position. The very first case (March, 1867) was striking. A sailor, 30 years of age, in good health, having suffered for nine years from granular lids, had been previously treated in New York, Boston, Philadelphia, and other places. The present violent outbreak came after an exposure of 10–12 hours to a severe storm, which he had to weather in an open boat 2 months ago. He entered the Infirmary in the following condition:—Conjunctiva of both lids and bulbus changed into a thick solid mass of trachoma follicles, furrowed by white scars produced by caustics; thin greenish secretion; highest degree of photophobia; both corneæ absolutely opaque, perforated upwards and outwards with large prolapse of iris; good perception of light. Canthoplasty done and wounds united by 5 sutures on each side; the lids, which could now be easily everted, were treated with pure nitrate followed by careful neutralization and constant application of iced compresses. Twenty-four hours later there was an abundance of purulent secretion, lids readily opened, photophobia materially diminished; patient feels very much relieved. On the third day the sutures were removed and the usual treatment continued, the case pro-

gressing very favorably. On the 32d day I made a large iridectomy on both eyes inwards and downwards, and discharged the patient on the 53d day in the following condition:

Right eye: Lids yet a good deal thickened; secretion trifling; cornea opposite the coloboma bright and clear, sees Snellen XX distinctly in 6 feet with stenopæic apparatus.

Left eye: Almost the same state and same vision.

This man I have been able to follow up ever since 1867 to this day; he is now a salesman in a clothing-store, and does well. So far he has not had a relapse, but uses a solution of sulphate of copper (gr. V) now and then, particularly during summer. V. = $\frac{XI}{XX}$ (March, 1874).

The second case I observed in June, 1867. Patient was a student of law. Disease of 7 years' standing. Had always been under treatment, principally by nitrate of silver, which has given the conjunctiva the usual gray-blue color. Cornea thickly vascularized; numerous superficial losses of substance, lids moderately swollen; secretion abundant. The young man cannot walk alone, and is led by his father. Canthoplasty was done at once, the eyes afterwards treated with sulphate of copper and cold water. In December, 1867, patient returned to his studies, and has now been for two years established in this city as a lawyer. No relapse yet. V. = $\frac{XII}{XX}$ (March, '74).

Encouraged by these first two cases, I have since done the insignificant little operation in a vast number of patients, the Eye Infirmary furnishing us with an enormous number of trachoma-sufferers; and all who have tried it have found it more or less valuable. I have no doubt that I have often done it where the case would have given just as good a result in the end without it, but the relief for the patient is so decided, it facilitates the application of other remedies to such a degree, and supports particularly the chief curative agent, the caustic, so evidently, that the limits of indication have grown wider and wider. Neither do I doubt that the permanent lessening of the pressure of the lids on the ball acts favorably against relapses. I am far from saying it prevents them altogether, but it certainly limits them to the minority of cases; and if a relapse appears, it is never very violent, and yields more readily to the

usual treatment. Taking further into consideration the fact that I have never seen a patient disfigured or even annoyed by symptoms directly brought on by the slitting of the outer canthus (blepharitis angularis, etc., etc.), I cannot blame colleagues, who have desired to give it even a wider range than I have done myself; I firmly believe that it will always prove a valuable contribution to our antitrachomatous therapeutics.

Diphtheritic Conjunctivitis.—Four years ago my friend Dr. Allin asked me to see at the N. Y. Eye Infirmary a young woman suffering from genuine diphtheritis. The usual treatment had so far not been able to arrest the nefarious course of the disease, and although we were well aware of Graefe's warning, "I am opposed to scarifications, because even the slightest wounds must become infiltrated by diphtheritic deposits, and thereby give rise to a new stasis of blood,"—we decided to do a canthoplasty, believing that the much dreaded specific infiltration of so small wounds as the operation produces could not possibly be of vital consequence, compared to the advantages which we might gain by a quick and permanent diminution of the pressure of the lids. The result of this first trial is described in the Transactions of the American Ophthalmological Society, 1871, page 91. Since that time I have kept on record 23 cases of more or less virulence, all treated without internal remedies, if the latter were not necessitated by the general condition of the patient, but in all cases without calomel. Canthoplasty and iced compresses, followed during the blennorrhoic state of the affection by the use of caustics, being the treatment. The worst of these cases I beg leave to mention minutely:

Girl of 4 years, seen first on May 5th, 1870. The child was taken home by her mother from the ship of her father in an open boat in very boisterous weather; got thoroughly wet, and complained of headache next morning. Eyelids swollen and closed by thin crusts, which were taken off by frequent washing with tepid water. The case grew worse during the day and following night, offering on the 3d day the following appearance: Lids badly swollen, of a blue livid color, excessively painful and hard to the touch; a thin, greenish secretion, mixed with white mucous flakes, running over the cheeks. Patient is very

restless; pulse 150–156; respiration, 48; temperature, 101°. Finding it impossible to get a view of the conjunctiva on account of the restlessness of the child, I administered a small dose of chloroform, which allowed a careful inspection. Diagnosis: Diphtheritic conjunctivitis. Treatment: iced compresses, mild aperient, no restriction in diet. Next day I saw the patient in company with Dr. Sinclair, finding her decidedly worse. Pulse, 160; temperature, 102°; nostrils closed with thick, greenish crusts; lips dry and coated; mucous membrane of mouth and fauces swollen and covered with white patches. Chloroform was again used and the lids carefully opened, when a glimpse obtained of the cornea showed the epithelial layer already fully infiltrated, with small losses of substance upwards. Being convinced that the next few hours would bring perforation of the cornea, I did canthoplasty on both eyes, making the wound as small as possible, and carefully uniting the conjunctiva to the skin by 3 sutures. The lids could be well everted at once, the conjunctiva offering all the symptoms of diphtheria in its worst state, of a gray color, bloodless, and very hard. Ordered ice applications and stimulants internally.

May 7th: The child had a bad night. I found new diphtheritic patches round the anus and vulva; the concha of left ear was badly swollen; temperature of body, 102°; lids thinner than day previous, soft and flabby, easily evertible; secretion thin and discolored; cornea not worse. Wound of the operation stiff and thickly infiltrated; sutures hold well. Same treatment aided by quinine and chloride of potassium.

May 8: Decided improvement of all symptoms locally and generally. Lids can be readily everted without aid of chloroform; swelling rapidly subsiding; conjunctiva showing spots of vascularization; cornea clearing up in its lower halves. Sutures all removed; treatment continued with addition of atropine.

May 9: Patient has constantly improved; swallows well; diphtheritic patches round anus and vulva in statu quo; lids reduced almost to normal size; copious blennorrhoic discharge; conjunctiva shows large, velvety patches, which were slightly cauterized; cornea clearing; ulcers healing. Treatment continued.

After this day the child improved steadily but very slowly, so

that I could not pronounce the eyes out of danger before the 19th. I saw her afterwards every day till the end of June, when she left for the country. In December she was again brought into town. The cornea presented two pretty large opacities corresponding to former losses of substance. In April of this year they were very small and circumscribed, apparently not affecting vision in the least.

During the four years following this first experience of the efficiency of cantholplasty, I have used it in all the cases I have seen (23), with the exception of one, a mother infected by her child, who did not return to the infirmary until the 5th day after the diagnosis was made and her attention called to the dangerous character of the disease. The cornea was then perforated at three different spots and vision hopelessly lost. Admitting now that half of the whole number would have recovered without the operation, there are 11 left which I believe would under no circumstances have ended so favorably. None of those 22 cases was lost; no cornea perforated. Seven eyes required iridectomy for central opacities, four of which I did myself, one was operated on by a friend of mine, and the two remaining are still at large. In no case was there any difficulty in the healing of the wound, in spite of more or less infiltration of the margins, nor was any deformity produced. As far as I know, cantholplasty has not been previously introduced as an auxiliary remedy in diphtheritis, and if it ever should be proved, beyond any doubt, that the real cause of this terrible disease is the immigration of bacteria into the tissue, internal treatment will be at once entirely given up and local therapeutics will reign supreme.

3d. *Blennorrhœa* (B. gonorrhoica and B. neonatorum).—I have already quoted Graefe's phrase of an "always victorious" treatment for blennorrhœa, and the expression is certainly true in regard to the vast majority of cases, if they come under our hands at not too late a moment. Nevertheless there is a number, particularly of gonorrhœal ophthalmia, in which our agents work far too slow for arresting the disease and its destructive tendencies, so that we cannot conscientiously decline to consider further contributions to our present therapeutic means, providing they are based à priori on a sound principle, and supported

by practical observation. I am not aware that canthoplasty has ever been used as a helpmate to the usual treatment of blennorrhœa.* My experience with it has been very limited; I have operated on 13 cases of gonorrhœal ophthalmia in 4 years (out of a total number of 53), and on 3 of O. neonatorum (total number 64), a very small quantity, but very important in quality. I beg leave to give the first case of the former in detail: In April, 1870, I saw a child, late in the evening, in consultation with Drs. Kudlich and Geissler, in Hoboken. The little patient was a very handsome, uncommonly well-developed girl of 4 years of age, who was brought to Dr. Geissler 2 days previous, suffering from what he then supposed to be a severe acute conjunctivitis. Ordered ice-compresses, and a dose of citrate of magnesia. Next morning, all the symptoms of gonorrhœal ophthalmia having developed, the doctor examined the vulva, and found a very virulent catarrh. Dr. Kudlich was at once called in, and it was then ascertained that 5 days previous a rape had been committed on the child by one of the boarders, who, when brought before court, was suffering from gonorrhœa. He confessed his guilt, and was promptly convicted. I found the child in bed in great agony, and administered chloroform to make a careful examination. The upper lid of right eye immensely swollen, overlapping the lower completely, and hanging down far over the cheek, of a blue-reddish color, and so tight that eversion was impossible even under the influence of the anæsthetic; a thin, yellow secretion oozing from under the lid in a constant stream. The chemotic conjunctiva bulbi covered the cornea so much, that only its centre could be seen; it was perfectly opaque, with a deep ulcer, of which the base had already begun to protrude. Canthoplasty was at once performed; the lid could then be easily and fully everted. Treatment: Cauterization with pure nitrate of silver, with careful neutralization by salt water; perforation of ulcer; atropine; iced compresses; small doses of morphia to keep the child quiet.

* The *Handbuch der gesammten Augenheilkunde*, Vol. III., 1st Part, reached me only a few days ago. Arlt says on page 443: "Canthoplasty was used by Graefe as a pressure—diminishing and antiphlogistic remedy in acute blennorrhœa."

2d day. *Under Chloroform.*—Swelling of lid and chemosis materially diminished. Secretion still very profuse. Cornea can be thoroughly examined; looks dim and opaque. Ulcer has been punctured again in the morning, and was reopened. Wounds of cantholasty well united. Same treatment.

3d day. All symptoms improved. Sutures taken out. Treatment continued.

The case then progressed favorably. Chloroform was dispensed with after the 7th day. The child left three months later for Europe in the following condition: Lid almost normal; in no way disfigured. A small circumscribed leucoma at the margin of the pupil. Vision apparently not injured. Cases of such virulence are not so very rare, and may be saved by the old régime alone: but with an ulcer with protruding base, the cornea stands very little chance while the trouble in the lids is still florid. I believe that without cantholasty this ulcer would have led to a broad perforation with its well-known consequences, the lids could never have been treated so thoroughly, and, finally, I should have considered it a very satisfactory result had a sufficient part of the cornea been saved to allow an iridectomy 6 months later.

The second case came under observation on the 4th day after the first symptoms had shown themselves. Was ascribed to a cold which the patient, a policeman, believed to have taken while on duty during a stormy night. Gonorrhœa contracted 11 days ago. All the symptoms severe; right cornea thoroughly hazy, left one perforated with prolapse of iris. The little operation was done at once, and the usual treatment followed. The sutures removed on second day. Final result: 12 weeks after first visit, right eye, vision normal; on left cornea a small, well-circumscribed leucoma adherent, with hardly any trouble of vision.

During March and April of the present year, I have treated 3 journeymen tailors, who lived in the same room. One of them was suffering from gonorrhœa, and the two others were infected undoubtedly by using the same washing utensils. Two of them were suffering in both eyes, the third from the right alone; the good left eye of the latter I put at once under an impermeable bandage. The others were treated in

the usual way, with canthoplasty added; all made a perfect recovery. The rest of the 13 cases do not need mentioning in detail; they all belonged to the worst class. Canthoplasty proved a very valuable assistant to the old treatment: diminished suffering, although it did not materially lessen the time in which the disease generally runs its course.

The three children with ophthalmia infantum, which I mentioned before, were all sadly neglected specimens (treated by warm applications), all showing perforations of cornea, with highly degenerated conjunctiva. In all of them the improvement was at once manifest after canthoplasty had opened the way for a sensible treatment of the lids; and in all three sufficient parts of the cornea were saved to allow large iridectomies.

4th. *Phlyctænular Conjunctivitis and Keratitis.*—It was this affection which furnished the largest amount of patients, and the results of the operation were so gratifying that it was at once adopted by the surgeons of some of our large institutions. It would be abusing the patience of the reader were I to cite cases. The results are shortly these: The operation stops at once the severe photophobia, which seems to be the principal cause of suffering. It allows a free use of such remedies (cauterization of cul-de-sac, red ointment, atropine) as before could only be employed either imperfectly or not at all. That this is a great advantage every one knows who has ever observed with what intense energy the little ones squeeze their lids the moment they are touched, or who has heard the excuse of the nurses that it is impossible to apply the remedies recommended. The greatest advantage, though, is the prevention of relapses. Dr. Wagner (l. c. page 110) says: "It would be interesting now to learn whether the author has succeeded in preventing somewhat the relapses of phlyctænular conjunctivitis by this operation (i. e., splitting of the outer cauthus). If so, he would be clearly entitled to the gratitude of the whole ophthalmological world." Well, the surgeon who first used canthoplasty in phlyctænular conjunctivitis will be grateful to Dr. Wagner for the compliment, be he who he may. This prevention of relapses not only in some, but in the vast majority of cases, say at least 85 per cent., was the first good office

I claimed for the operation as far back as 1869, and since that time all those who have adopted it in this country have often been witness to its efficiency. I am sorry not to understand Russian, so as to be able to read Dr. Schmid's Odessa report in the original. The report of Dr. Ryder in Zehender's *Monatsblätter* for January, 1873, does not state clearly when simple splitting of the canthus, and when canthoplasty was performed. But in regard to this power of preventing relapses, it will need only very little experimenting to convince the most sceptical. In this country the operation has been done for all forms and in all states of phlyctaenular conjunctivitis and keratitis. My principle is to perform it even in very mild cases, if they prove very obstinate.

5th. *Keratitis diffusa.*—Hutchinson's disease is very frequent with us. The best remedy we have is, and very likely always will be, moist heat, such as recommended by the English oculist. Everybody knows the obstinacy of the disease and the difficulty of treatment—the suffering of the patient when what was gained through months is lost again in a few days;—and therefore it may be well to mention the only case in which I have performed canthoplatsy. The patient was a girl of 10 years of age—a typical case—brought to me by her father, to whom I clearly stated the character of the affection as inherited syphilis. He then informed me that his wife a year and a half ago gave birth to a child suffering from pemphigus, which caused its death on the 11th day; that she was ailing after this, and had died some 7 months ago, the physician in charge having at that time expressed his opinion that syphilis, contracted from the baby, was at the bottom of her trouble. This gentleman devoted himself at once entirely to the care of his daughter, applying himself the warm applications for from 6 to 8 hours every day. The patient did very well in the beginning under the usual general and local treatment, but had frequent relapses, and, although gaining visibly in health, did not seem to have great chances for ultimate recovery. After 27 months of constant care, during which time the warm applications had only been interrupted by a trip to Europe, and by a stay of 2 months with a relative, the child suffered from a fresh attack of great violence. I proposed canthoplasty, stopped the warm

poultices for a week to see the wounds well healed, and then began again with them very energetically. Three weeks were enough to bring on a surprising cure. For two years the child has been well with a vision of $\frac{XIX}{XX}$. This is so far an isolated experience with me. I hear that others have done the same, but cannot state any results. I think it justifies further proceedings in the same direction.

6th. *Ulcus serpens* (Saemisch).—This nefarious form is not as rare with us as we might well wish, and in spite of the best care on the part of physician and patient, the "hypopion keratitis" (Roser), or non-irritating suppurative infiltration of the cornea (Graefe), is a foe against whom we are generally absolutely powerless. I have done canthoplasty together with the usual treatment of puncturing or splitting the ulcer in 2 cases, without observing any effect either good or bad.

7th. *Softening exudations in the cornea.*—The cases of keratitis, leaving more or less dense opacities in the cornea, which swell from time to time, and keep up an almost constant state of irritation, are not frequent. With permission of Dr. Loring, I briefly state the following case:

Healthy woman of 25 years. Keratitis with perforation 2 years ago, leaving a large leucoma adherens. Frequent vascularization of the cornea together with decided symptoms of secondary glaucoma induced the doctor to perform iridectomy. The glaucoma disappeared, but the irritation of the cornea showed itself as often as before. But after canthoplasty, 10 months ago, this also has ceased.

In diseases or malformations of the eyelids, canthoplasty has for a great many years been so fully tested that further remarks on this class of affections seem superfluous. It cannot be too highly recommended as a helpmate of the various operations in use for trichiasis, entropion caused by shrinking of the conjunctiva after trachoma, etc., etc.

I would call special attention to cases of total blindness brought on by granular lids, blennorrhœa, and diphtheria, in which the operation was performed solely for the purpose of relieving the sufferings of the patients caused by the chronic irritation of the conjunctiva. The annoying lachrymation and

secretion were in almost all cases entirely stopped or greatly lessened, and a comparatively comfortable state of things established.

Only seldom have I been obliged to repeat the operation. A couple of very obstinate cases of trachoma happening in the practice of friends of mine or in my own, where it seemed advisable to perform it for a second time, gave excellent results.

The value of the procedure may be stated in a few words: in trachoma, diphtheria, and blennorrhœa it may prove the chief agent of treatment. In trachoma and phlyctaenular conjunctivitis and keratitis, its principal merit lies in shortening the attack, preventing relapses, relieving suffering quickly, and supporting powerfully the efficiency of other remedies. In diseases of the lids requiring operations it greatly improves the chances of the latter. In ulcus serpens (Saemisch) and diffuse keratitis (Hutchinson) it may become a desirable support of the treatment so far in use. Adding to this the fact that it is very easily done, that it can never do any harm, and never causes any disfiguration if properly performed, I am sure it will not be entirely overlooked as a contribution to the ophthalmic therapeutics.

About the performance of the operation I do not need to speak. If the lids are well separated, a simple cut down to the malar bone, producing a wound of the outer integument not larger than 8 mm., will in most cases fully relax the pressure of the lids. Slight modifications of this first act must be left to the discretion of the surgeon. The greatest neatness is of course required in uniting the conjunctiva to the skin. Three sutures are generally sufficient, but the operator must judge for himself how many he thinks proper to use.

SCHNELLER'S OPERATION FOR TRICHIASIS AND ENTROPION OF THE LOWER LID. By J. S. Prout, M.D., of Brooklyn, N. Y.

In the *Annales d'Oculistique* for March–April, 1874, there is a description of Schneller's operation, taken from A. Von Graefe's *Archiv für Ophthalmologie*, vol. xix. part 2. It is as follows: Two incisions, through the skin only, parallel to the palpebral border, are united at their ends so as to include an elliptical portion of skin, which is left in position, but the skin above and below it is dissected up, and the two free margins are united through their whole extent by sutures *over* the circumscribed portion, which is thus, as it were, buried. After a time its epithelium seems to disappear and it fuses with its covering.

The covered piece acts the part of a splint in stiffening the lid, and thus opposes the tendency to inversion; at the same time the skin of the lid is shortened by the distance between the two incisions. I have done this operation once and obtained a satisfactory result.

Mrs. H., æt. 77, consulted me a year ago on account of spasmodic inversion of both lower lids. On June 2, 1874, she came again, requesting that an operation should be done for the relief of her condition. There was no contraction of the conjunctiva nor trichiasis, but the inverted cilia irritated the conjunctiva, causing spasmodic action of the orbicularis muscle. Schneller's operation was advised, and on the 4th, two days later, it was performed, without anæsthetic or assistant, on the left eye which was the worse of the two. Making the incision round the piece to be covered in was found to be the only difficult step of the operation. The upper line was carried about one and

one-half lines from the palpebral border, the lower about three lines farther down. When their extremities were united, the ellipse thus made was about three lines in vertical and nine lines in horizontal measurement, to close which four or five sutures were introduced. On the 6th, the lid was but little swollen; the edges of the wound were partially united; there was no inversion. Some of the sutures were now taken out. On the 8th, the remaining sutures were removed, and, as there was not complete union, contractile collodion was used to close the wound. On the 13th, there was nearly complete union. A small abscess, or stye, more properly, had formed at the palpebral border,—not in the wound. Collodion was applied again. On the 16th, the stye was incised; the wound had united. On the 27th, there was no inversion; the lid was firm.*

The right eye, which was affected to a much less degree, was not operated on, but contractile collodion was used with good effect. When the inversion of the left lower lid was cured, and with it the irritation of the conjunctiva, the inversion of the right became but little annoying, and by the use of the collodion was entirely overcome.

* On the 7th of August, nine weeks after the operation, at the site of the wound there was a small, scarcely noticeable, wart-like puckering or projection of the skin, which could have been easily snipped off with scissors. The patient was perfectly satisfied with the result.

A CONTRIBUTION TO THE STATISTICS OF CATARACT EXTRACTION OF ONE HUNDRED AND EIGHTEEN RECENT CASES. By C. R. Agnew, M.D.

The cases in the tables that follow are given as they occurred, and without selection or exclusion.

They include several in which the most unfavorable prognosis was declared, and in which the bare chance of a good result was accepted by the subject.

Some of the desperate cases did well, and some in which a favorable prognosis had been declared did badly, thus showing that however carefully we may weigh probabilities we are liable to error, and that those who are blind with even seriously complicated cataract are entitled to a the chances of a good method of operating.

The methods of operating used were those known as Graefe's, Liebreich's, Lebrun's, and the "old flap." My opinion has at times been much unsettled as to the method which offers the best prospect for useful vision in the greatest number of cases. I have, however, about come to the conclusion that the Graefe operation is the best, provided the middle of the cut is not made far from the junction of the sclerotic and clear cornea.

An insufficient wound is the most dangerous complication of a cataract extraction. Some of the so-called membranes in the pupil were so delicate as to be detected only by careful scrutiny with the ophthalmoscope or oblique illumination.

I have great pleasure in saying that most of the work of watching and recording the cases has been done by my assistant, Dr. David Webster, whose accuracy and carefulness are proverbial.

EXTRACTIONS BY VON GRAEFE'S METHOD.

No. of Case.	Sex.	Age.	General Condition.	Character of Cataract.	Complications.	Anæsthetic.	Section Upwards.	Section Downwards.	Accidents in Operation.	Complications during Recovery.	Secondary Operations.	Resulting Vision.
1	F.	69	.....	Hard.....	.....	None.....	...	1	.....	.....	.....	V. = $\frac{1}{2}$
2	M.	65	.....	Hard.....	.....	None.....	...	1	.....	.....	.....	V. = $\frac{20}{200}$
3	M.	65	.....	Hard.....	.....	Ether and Chlor.	..	1	Spoon used.	Membrane in pupil	1 needling.	V. = $\frac{1}{10}$
4	F.	(?)	.....	Hard.....	.....	Ether.....	...	1	.....	Membrane in pupil	4 needlings	V. = $\frac{20}{40}$
5	F.	68	.....	Hard...	Staph. post. touching macula.	Ether.....	...	1	.....	Membrane in pupil	1 needling.	V. = $\frac{1}{10}$
6	M.	65	.....	Hard.....	.....	Chlor.....	...	1	.....	Membrane in pupil	1 needling.	V. = $\frac{20}{100}$
7	M.	58	Insane....	Hard.....	.....	Ether.....	...	1	.....	.....	.....	V. = 0
8	F.	62	.....	Hard.....	.....	Chlor.....	...	1	.....	.....	.....	V. = $\frac{20}{30}$
9	F.	62	.....	Hard.....	.....	Chlor.....	...	1	.....	Membrane in pupil	1 needling.	V. = $\frac{20}{50}$
10	M.	76	Feeble....	Hard.....	.....	Ether.....	...	1	.....	.....	.....	V. = $\frac{1}{3}$
11	M.	43	Corpulent.	Semifluid.	.....	Ether.....	...	1	Some vitreous lost.	Iritis with closure of pupil.	1 iridectomy, 1 keratonyxis.	V. = 0
12	M.	75	.....	Hard.....	.....	Ether.....	...	1	.....	.....	.....	V. = $\frac{20}{80}$
13	M.	49	.....	Hard.....	.....	Ether.....	...	...	.....	Iritis with closure of pupil.	1 iridotomy, 1 needling.	V. = $\frac{20}{100}$
14	M.	43	Diabetic Cataract.	.....	Diabetis.....	Ether.....	...	...	.....	.....	.....	"Reads ordinary print."

15	M.	76		Hard		Ether					V. = $\frac{20}{40}$
16	M.	76		Hard		Ether	1				V. = $\frac{20}{70}$
17	M.	43	Good	Hard		None	1	Iritis; closure of pupils.	Iridotomy		V. = $\frac{20}{80}$
18	M.	49		Hard		None					V. = $\frac{20}{30}$
19	M.	43		Hard		Ether					V. = $\frac{1}{12}$
20	M.	73		Hard		None	1				V. = Counts fingers.
21	F.	68	Gouty; enlarged joints.	Hard		None	1	Iritis and closure of pupil.	Iridotomy		V. = $\frac{20}{70}$
22	F.	45	Corpulent	Hard		Ether	1	Membrane in pupil			V. = $\frac{20}{200}$
23	M.	61	Atheromatous arteries	Hard		Ether	1				V. = $\frac{20}{70}$
24	F.	65	Good	Hard		Ether	1				V. = $\frac{20}{30}$
25	F.	71	Gouty; enlarged knuckles	Hard		Ether	1	Iritis with closure of pupil.	Iridotomy		V. = Perception of light.
26	M.	60		Hard		Ether and Chlor.	1				V. = $\frac{20}{40}$
27	F.	63	Poor	Hard		Ether and Chlor.	1	Iritis; membrane in pupil.			V. = Sees to go about alone.
28	M.	54	Fair.	Hard		Ether and Chlor.	1	Membrane in pupil	Keratonyxis		V. = $\frac{20}{50}$
29	M.	75	Extremely feeble.	Black Cataract.		Ether and Chlor.	1	Hemorrhage from choroidal vessels.			V. = 0

No. of Case.	Sex.	Age.	General Condition.	Character of Cataract.	Complications.	Anæsthetic.	Section Upwards.	Section Downwards.	Accidents in Operation.	Complications during Recovery.	Secondary Operations.	Resulting Vision.
30	M.	43	Corpulent.	Semifluid.	Detachment of retina of fellow eye	None		1	Hyaline ruptured before section was complete; spoon used; some vitreous lost.	Thick membrane formed	Paracentesis; iridotomy	V. = $\frac{20}{50}$
31	F.	35	Poor.	Semifluid.		Ether and Chlor.	1			Membrane in pupil	Keratonyxis	V. = $\frac{20}{20}$
32	F.	70		Hard.		Ether and Chlor.	1					V. = $\frac{20}{200}$
33	M.	60		Hard.		None	1			Membrane in pupil		V. = Counts fingers.
34	F.	72	Gouty; enlarged knuckles	Hard.		None	1					V. = $\frac{20}{30}$
35	F.	62	Good	Hard.		Ether	1			Membrane in pupil	Keratonyxis	V. = $\frac{20}{20}$
36	M.	57	Paralysis Agitans.	Hard.	Myopia with staph. post.	None		1				V. = $\frac{20}{20}$
37	M.	48	Poor	Black cataract; fluid vitreous, and tough capsule. Congenital atrophy of fellow eye.		None	1			Conjunctivitis		V. = $\frac{20}{100}$

38	M.	47	Good.....	Hard.....	.....	None.....	1	.....	.....	.....	V. = $\frac{20}{40}$
39	M.	57	Poor.....	Hard.....	.....	None.....	1	.....	Iritis; membrane in pupil.	Iridotomy.	V. = $\frac{20}{30}$
40	M.	81	Marasmatic	Hard.....	.....	None.....	1	.....	.....	.....	V. = $\frac{20}{40}$
41	M.	58	Poor.....	Hard.....	Myopia.....	Chlor....	1	.....	.....	.....	V. = $\frac{10}{50}$
42	F.	76	Asthma...	Hard.....	Visual field doubtful on nasal side.	Ether....	1	...	Cornea collapsed and wrinkled.	.....	.....	V. = $\frac{20}{200}$
43	F.	75	General senile atrophy	Hard nucleus; soft cortex.	.....	Ether....	1	.....	Pupil filled with soft lens matter	.....	V. = $\frac{20}{200}$
44	F.	57	Good.....	Hard.....	Opacity of cornea.	Ether....	1	.....	.....	.....	V. = $\frac{20}{200}$
45	F.	57	Good.....	Hard.....	Opacity of cornea.	Ether....	1	.....	.....	.....	V. = $\frac{20}{200}$
46	F.	56	Had general dropsy twice; very weak.	Semifluid.	.....	Ether....	1	.....	Iritis; membrane in pupil.	Iridotomy.	V = Unknown.
47	F.	58	Dyspeptic.	Small nucleus; much soft cortex.	.....	Ether....	1	.....	.....	.....	V. = $\frac{20}{100}$
48	F.	74	Feeble....	Hard.....	.....	Ether....	1	Lens shaky, showing rupture of hyaline before section completed; cornea wrinkled.	Iritis; membrane in pupil.	.....	V. = $\frac{20}{100}$

No. of Case.	Sex.	Age.	General Condition.	Character of Cataract.	Complications.	Anæsthetic.	Section Upwards.	Section Downwards.	Accidents in Operation.	Complications during Recovery.	Secondary Operations.	Resulting Vision.
49	M.	74	Dyspeptic and half starved.	Hard		Ether	1		Hemorrhage from limbus into ant. chamber; cornea wrinkled.	Membrane in pupil.		V. = $\frac{20}{200}$
50	F.	60	Rheumatic and dyspeptic.	Hard		Ether	1		Cornea wrinkled.			V. = $\frac{20}{50}$
51	M.	61	Good	Calcareous degeneration of capsule.		Ether	1		Extracted capsule with forceps after ext. of lens.			V. = $\frac{20}{100}$
52	M.	55		Old choroiditis; fluid vitreous.	Fellow lost by Extr. (panophthalmitis).	None	1		Lens in capsule extruded with vitreous by spasm of orbicularis.	Hyalitis		V. = Sees to go about alone.
53	E.	67	Goitre; catarrh.	Hard		None	1		Iris fell before knife and was cut.	Delicate membrane in pupil.		V. = $\frac{20}{30}$
54	F.	58	Mother of 14 Children.	Hard nucleus; soft cortex.		Ether	1		Bleeding into ant. chamb. from limbus; small fragment of cortex left in centre of pupil.	Iritis; membrane in pupil.		V. = $\frac{16}{50}$
55	M.	61	Smokes from 6 to 10 pipes a day.	Hard		None	1		Hyaline gave way on completion of iridectomy; removed lens with scoop; lost vitreous and left some cortex in field of pupil.	Eye lost by Hyalitis.		V. = 0

56	F.	58	Dyspeptic; weak; nervous.	Hard; developed with much pain.		Ether.	1			Slight serous iritis.	V. = $\frac{20}{20}$
57	F.	41		Hard.	Extracted after 14 needlings; eye extremely myopic.		1			Membrane in pupil	V. = $\frac{6}{200}$
58	F.			Hard.			1				V. = $\frac{20}{20}$
59	M.	57		Hard.		Ether.	1			Loss of vitreous with prolapse of Iris from vomiting while coming out of anæsthetic state.	V. = $\frac{20}{40}$
60	M.	50		Hard.			1			Cystoid cicatrix	V. = $\frac{20}{40}$
61	F.			Hard.							V. = $\frac{1}{20}$
62	F.	66		Hard.		Ether.	1				V. = $\frac{20}{20}$
63	F.	36				Ether.	1			Membrane in pupil Keratonyxis	V. = $\frac{20}{40}$
64	F.	58			Synech. post.						"Has sharp vision."
65	M.	40					1	Hemorrhage into ant. chamb.			V. = $\frac{20}{60}$
66	M.	70			Synech. post. and Staph. post. with previous iridectomy		1	Spoon used to evacuate lens.			V. = "Reads Jaeger No. 3 at 7″."
67	F.	55				None.		Spoon used to evacuate lens.			V. = $\frac{5}{70}$
68	M.	35					1				V. = Not recorded.
69	M.	54				Chlor.					V. = "Can read and write."

No. of Case.	Sex.	Age.	General Condition.	Character of Cataract.	Complications.	Anæsthetic.	Section Upwards.	Section Downwards.	Accidents in Operation.	Complications during Recovery.	Secondary Operations.	Resulting Vision.
70	M.	60										"Reads ordinary print."
71	F.	55						1	Lens brought out with spoon.			V. = $\frac{20}{10}$
72	F.	37									Needling	V. = "Reads ordinary print."
73	F.	47					1		Spoon used to remove lens	Capsular opacity		V. = $\frac{20}{100}$
74	M.	54				Chlor.		1				V. = $\frac{20}{50}$
75	F.	67						1				V. = 0
76	M.	64				None.	1					V. = $\frac{20}{200}$
77	F.	63				None.	1					Unknown.
78	F.	70				None.	1					"Reads ordinary print."
79	M.	54				Chlor.				Panophthalmitis.		V. = 0
80	F.	65				None.		1				V. = $\frac{20}{40}$
81	F.	69	Rheumatic and dyspeptic.	Hard.	Small cornea, 5" diameter.	Ether.	1		Dialysis of iris produced by point of knife in making section which was enlarged with scissors.	Iritis without pain—membrane in pupil.		V. = $\frac{20}{60}$
82	F.	40	Nervous.	Hard.		Ether.	1			?		V. = $\frac{20}{60}$

83	F. 38	Good ...	Soft—traumatic.	None	Ether..	1	.....	.....	.....	.....	V. = $\frac{20}{30}$
84	F. 66	Subject to attacks of erysipelas.	Hard.....	.....	Ether..	1	.....	.....	.....	.....	V. = $\frac{20}{50}$
85	F. 64	Corpulent.	Hard.....	.....	Ether..	1	.....	.....	.....	.....	V. = $\frac{20}{60}$

EXTRACTIONS BY LIEBREICH'S METHOD.

No of Case.	Sex.	Age.	General Condition of Patient.	Character of Cataract.	Complications.	Accidents in Operation.	Condition of eye after operation.	Complications during Recovery from Operation.	Secondary Operations.	Resulting Vision.
1	F.	45	Poor.....	Hard.....	.....	.....	Pupil clear and circular.	Catarrhal conjunctivitis and immobility of lower segment of iris	.....	V. = $\frac{20}{30}$
2	M.	40	Fair	Pasty ..	Atrophy of fellow eye from needling.	.....	Pupil clear and circular	.....	.....	V. = $\frac{20}{30}$
3	F.	21	Fair	Semifluid.	11 needlings had caused absorption of lens in the other eye.	Prolapse of iris successfully reduced.	Pupil clear and circular.	Prolapse of iris; iritis; closure of pupil.	Iridotomy..	V. = $\frac{20}{100}$

No. of Case.	Sex	Age.	General Condition of Patient.	Character of Cataract.	Complications.	Accidents in Operation.	Condition of Eye after Operation.	Complications during Recovery from Operation.	Secondary Operations.	Resulting Vision.
4	M.	60	Fair	Hard			Pupil clear and circular.	Soft lens matter seen in pupil 48 hours after extraction.	Keratonyxis.	V. = $\frac{20}{20}$
5	F.	63	Good	Hard			Pupil clear and circular.			V. = $\frac{20}{20}$
6	F.	35	Poor	Traumatic			Pupil clear and circular.	Soft lens matter seen in pupil a few days after extraction; serous iritis.	Paracentesis	V. = $\frac{20}{200}$
7	M.	40	Poor	Traumatic	Leucoma; Synech. post. and ant.; fluid vitreous.	Loss of vitreous; collapse of cornea; spoon used.	Collapsed eyeball.	Panophthalmitis.		V. = $\frac{0}{0}$
8	F.	56	Excessively nervous.	Hard			Pupil clear and circular.	Catarrhal conjunctivitis; immobility of lower segment of iris; membrane in pupil.		V. = $\frac{20}{200}$
9	M.	50	Weighs 325 lbs.	Hard			Pupil clear and circular.	Prolapse of iris 24 hours after extraction.	Excision of prolapsed iris.	V. = $\frac{20}{100}$
10	F.	34	Very poor	Inflammatory	Extreme myopia; atrophy of choroid.		Pupil clear and circular.	Cortical matter in pupil some days later; membrane.	Keratonyxis.	V. = $\frac{1}{20}$
11	M.	60	Thin and wiry.	Hard			Pupil clear and circular.	Catarrhal conjunctivitis; membrane in pupil.	Keratonyxis.	V. = Percep. of light.

12	M. 35	Fair	Semifluid.			Pupil clear and circular.	Large prolapse of iris 24 hours after extraction; iritis; membrane in pupil.	Excision of prolapsed iris.	Counts fingers.
13	M. 70	Hemiplegia from Apoplexy.	Hard...	Couching had been done on the other eye; iris tremulous; eye frequently red and painful.		Pupil clear and circular.	Prolapse of iris seen next day; slight iritis.		V. = $\frac{16}{20}$
14	M. 65	Fair	Hard.....	Myopia		Pupil clear and circular.	Serous iritis; membrane in pupil.	Paracentesis done twice.	V. = $\frac{20}{30}$
15	M. 52	Fair	Hard.....			Pupil clear and circular.	Slight membrane in pupil.		V. = $\frac{20}{40}$
16	M. 70	Marasmatic.	Hard.....	Totally inelastic iris.	Wound enlarged with scissors; spoon used.	Pupil clear and circular.	Panophthalmitis.		V. = $\frac{0}{0}$
17	M. 72	Good	Hard.....			Pupil clear and circular.	Membrane in pupil.	Keratonyxis.	V. = $\frac{20}{20}$
18	F. 69	Good	Hard.....		Slight loss of vitreous.	Pupil clear and circular.	Synechia anterior of all the iris below the cut.		V. = $\frac{20}{70}$
19	M. 63	Good	Hard.....	Inelastic iris	Wound enlarged with scissors at both ends; vitreous lost.	Cornea collapsed.	Synechia anterior of all below cut; membrane in pupil.	Keratonyxis.	V. = $\frac{20}{20}$
20	F. 41	Good	Hard.....				Membrane in pupil.	Keratonyxis.	V. = $\frac{20}{60}$
21	M. 64	Dyspeptic and nervous.	Immature.	Myopia with staphyloma posticum.	Slight iridectomy	Pupil clear and circular.	Panophthalmitis.		V. = 0

EXTRACTIONS BY LEBRUN'S METHOD.

No. of Case.	Sex.	Age.	General Condition of Patient.	Character of Cataract.	Complications.	Anæsthetic.	Accidents in Operation.	Complications during Recovery.	Secondary Operations.	Resulting Vision.
1	F.	60	Gouty; rheumatic knuckles; neuralgia	Hard nucleus; soft cortex.	.....	None.	Iridectomy of pupillary border of iris; soft lens matter milked out; cornea flaccid.	Membrane in pupil absorbed without any secondary operation.	.....	V. = $\frac{20}{20}$
2	F.	70(?)	.....	Hard nucleus; soft cortex.	.....	None.	Soft lens matter milked out and pupil left clear; marginal iridectomy.	Slight serous iritis.	.....	V. = "Reads ordinary print easily."
3	F.	65	Poor.....	Hard nucleus; soft cortex.	Fellow eye lost by inflammation following extraction.	None...	Blood and cortical left in pupil.	No inflammatory reaction.	.....	V. = $\frac{20}{30}$
4	F.	35	Feeble.....	Soft	.....	None...	.....	.....	.....	V. = $\frac{20}{30}$
5	F.	44	Marasmic	Semifluid ..	Synech. post. Previous iridectomy.	None...	.....	No inflammatory reaction.	.....	V. = Counts fingers.
6	F.	44	Marasmic	Semifluid ..	Synech. post. .	None.	Lebrun's section with iridectomy. The capsule was so tough that it had to be extracted by forceps before the lens would move from its fossa.	No inflammatory reaction.	.....	V. = Counts fingers.

EXTRACTIONS BY THE OLD FLAP METHOD.

No. of Case.	Sex.	Age.	General Condition of Patient.	Character of Cataract.	Complications.	Anæsthetic.	Flap. Upwards.	Flap. Downwards.	Accidents in Extraction.	Complications during Recovery.	Secondary Operations.	Resulting Vision.
1	M.	55	Good.	Hard.		None.	1					V. = $\frac{20}{20}$
2	M.	80	Atrophy of old age.	Hard.			1					V. = $\frac{20}{20}$
3	F.	70	Fair.	Hard.		None.	1					V. = $\frac{20}{20}$
4	F.	65				None.		1		Prolapse of iris caused by fit of sneezing.	Hook operation for pupillary membrane.	V. = $\frac{20}{20}$
5	F.	61				Chlor.	1					V. = $\frac{20}{20}$
6	M.	53				Ether.	1				Keratonyxis for membrane.	V. = $\frac{20}{20}$

STATEMENT OF RESULTS.

Graefe's	Successes	66	
	Partial Successes	9	
	Failures	7	85
	Unknown	3	
Liebreich's	Successes	15	
	Partial Successes	2	21
	Failures	4	
Lebrun's	Successes	4	
	Partial Successes	2	6
Flap	Successes		6
	Total		118

Successes	91	= 77½ per cent.
Partial Successes	13	= 10½ per cent.
Failures	11	= 9½ per cent.
Unknown	3	= 2½ per cent.
Total	118	

In 11 cases V. = $\frac{20}{200}$
In 12 cases V. = $\frac{30}{200}$
In 1 case V. = $\frac{15}{200}$
In 1 case V. = $\frac{25}{200}$
In 14 cases V. = $\frac{40}{200}$
In 8 cases V. = $\frac{50}{200}$
In 5 cases V. = $\frac{70}{200}$
In 1 case V. = $\frac{100}{200}$
In 5 cases V. = $\frac{150}{200}$
In 2 cases V. = $\frac{200}{200}$
In 9 cases V. = $\frac{20}{100}$
In 2 case V. = $\frac{1}{5}$
In 1 case V. = $\frac{1}{3}$
In 11 cases V. = $\frac{20}{200}$
In 8 cases V. = Ability to read ordinary print.

91 cases reckoned as successes.

In 1 case V. = $\frac{1}{12}$
In 1 case V. = $\frac{5}{70}$
In 2 cases V. = $\frac{1}{20}$
In 1 case V. = $\frac{6}{200}$
In 1 case V. = $\frac{1}{50}$
In 7 cases V. = Ability to get about alone, count fingers, etc., etc.

13 cases reckoned as partial successes.

In 9 cases V. = 0.
In 2 cases V. = Faint perception of light

11 cases reckoned as losses.

In 3 cases the result is unknown.

Remarks.

Loss of vitreous occurred 3 times in the 21 Liebreichs, or in $14\frac{2}{7}$ per cent.; 4 times in the 85 Graefes or in $4\frac{7}{10}$ per cent.; and not at all in the Lebruns and old Flap.

The lens was removed by the scoop in 5 Graefes, or about 6 per cent.; in 2 Liebreichs, or about $9\frac{1}{2}$ per cent., and not at all in Flap or Lebruns.

Prolapse of iris occurred during recovery in the Liebreichs 4 times, about 19 per cent.; in the Flap once, $16\frac{2}{3}$ per cent.; in the Graefes once, less than $1\frac{1}{2}$ per cent., and in the Lebruns not at all.

Cystoid cicatrix occurred in one Graefe, and in none of the other methods.

Synechia anterior occurred in 2 Liebreichs where there had been no prolapse of iris.

Immobility of the portion of iris below the cut, either from synechia posterior, or from a localized iritis with interstitial thickening, was noted in *two* Liebreichs.

Iritis with closure of pupil occurred in 5 Graefes and in 1 Liebreich.

Serous iritis occurred in 2 Liebreichs and in 1 Lebrun.

Panophthalmitis occurred in 3 Liebreichs and in one Graefe.

Hyalitis occurred in 2 Graefes.

Pupillary Membranes formed in 20 Graefes and in 8 Liebreichs.

Sympathetic Irido-choroiditis, destroying both eyes, occurred in one Graefe.

Notes of cases in which loss occurred after operation by Graefe's method.

Case 7.—H. K., 58. Nothing peculiar observed in the physical condition of the patient, except that he was extremely loquacious and had acne rosacea. Extraction done December 1st. A small portion of pupillary margin of iris was cut off in making the section. On lacerating

the capsule fluid cortical substance flowed into and obscured the anterior chamber. The lens was easily extruded, but it seemed to be necessary to use a spoon to remove some small pieces of cortical from the anterior chamber. This patient took ether very quietly, and was left for a few moments by his attendant, after he had been informed of the safe removal of the cataract and replied that he was very comfortable. In the course of half an hour the patient was found to have removed, during the temporary absence of his attendant, the black silk mask and strips of isinglass plaster with which his eye had been closed, and to have dressed himself for a walk. The patient was, after much difficulty, put to bed again and his clothes hidden and the dressings renewed.

December 7th: Eye looks well; wound healed. Counts fingers readily.

December 25th: Eloped from hospital, having found his clothes and borrowed a hat.

January 5th: Returned again. Examined ophthalmoscopically and found to have retino-choroiditis with floating bodies in vitreous, and possibly a small retinal detachment.

Case 11.—J. F., 43, muscular, and corpulent. Extraction attempted by Graefe's method, December 15. It was impossible to produce complete anæsthesia of the eye by means of chloroform. The patient struggled excessively against the anæsthetic, and would suddenly become stertorous and asphyxiated, compelling efforts to be made for his partial resuscitation. Under these circumstances there was a premature loss of aqueous in the attempt to make the section, and we were forced to desist. The wound healed kindly, and on January 1st another attempt was made to operate, under ether. The ether affected the patient as badly as the chloroform had, and at no time could anæsthesia of the eye be accomplished, although a pint of ether was used in a cone. There was so much muscular rigidity and straining, that two or three persons were engaged in holding the patient while the ether was being assiduously administered. The section was, however, completed. In cutting out, the iris came in front of the knife, and was so cut as to leave the margin of the pupil intact, forming an isthmus, as it were, between a large irregular perforation and the pupil.

After lacerating the capsule, this isthmus-like segment of the pupillary margin was drawn out by means of forceps, and out with scissors in such a manner as to complete the coloboma. While performing this manipulation, the vitreous prolapsed, and two or three minims of it escaped in a gushing manner.

The eyes were closed with isinglass-plaster strips, and a black silk dressing.

As there was little or no pain, it was deemed wise, in view of the large amount of vitreous humor lost, not to open or expose the eye, especially as the removal of the outer dressing showed that there was neither swelling nor discoloration of the eyelids, nor any discharge.

January 15th: At this date the eye was opened, the cornea found to be clear, anterior chamber restored, circum-corneal injection slight. A slow iritis now set in without pain or increase of tension.

February 7th: Coloboma bridged over by a membrane.

At this date the patient, having good perception of light, was allowed to go home.

April 28th: We attempted to tear the membrane in the pupil by means of a stop-needle and sharp hook; patient under insufficient chloroform. Failed to secure an open pupil.

July 11th: Did an iredectomy. Succeeded in removing a sufficient piece of iris from nasal side of the coloboma, but not in maintaining an open pupil.

October 10th: Needled the membrane. After recovering from this operation, the patient had good vision, enabling him to read and write in his occupation—that of a lawyer. After a lapse of several months, however, vision began to fail, and then suddenly went, and the ophthalmoscope revealed almost total detachment of the retina.

Case 25.—E. K. W., 71. Patient had marked senile atrophy. Eyelids and general skin flaxed and inelastic, and knuckles much enlarged by gouty deposits.

Graefe's operation done under ether and without accident or vomiting. Eye did badly from second day; corneal wound did not heal until 15th day. Choroiditis with large lymphoid effusions in anterior chamber, reduced V. to perception of light, and

so matted iris as to make any operation for secondary cataract hopeless.

This eye was enucleated some months afterwards by Prof. Bacon, of New Haven, who did a Liebreich upon fellow eye, resulting in useful vision.

Case 29.—H., æt. 75. Lenses have both begun to undergo secondary degeneration, have dark chocolate-colored nuclei, especially the left with striæ, and veins of a whitish calcific character mottling or marbling them. Right eye probably involved in an injury of that side of face in childhood, as there are extensive scars. V.=counts fingers in one foot. Patient is an old rheumatic, has marked senile marasmus, and is very feeble. V.= L. E. perception of light only. No limitation of visual field; phosphenes present.

October 13, 1874: L. E. operated upon by Graefe's method. Mixture of equal parts of ether and chloroform given.

The cornea was very flaccid, wrinkling after escape of aqueous; lens large and very dark-colored nucleus. No accident during the operation nor loss of vitreous. Isinglass plaster and black silk dressing applied.

October 14th: Has had little or no pain since operation. Slept well without hypnotic. During the night blood issued from beneath the dressings. This morning eye examined: blood oozing from ciliary region through wound. Atropia instilled; bandage and charpie applied. Had some bloody oozing, until 20th, when wound of cornea healed. On 30th October was discharged. Wound healed; coloboma still open and showing a dark, olive-colored reflex. V.= faint perception of light.

Case 55.—J. K., 61. Had right eye injured and vision impaired, by wound from foreign body, eight or ten years ago, resulting after some years in a cataract. Has a central scotoma; circumference of visual field unaffected.

November 12, 1873: Operated upon the right eye by Graefe's method, without anæsthetic. Speculum and fixation forceps used, and section made easily. Iridectomy made in usual manner. This was immediately followed by gushing escape of vitreous humor. Removed lens by means of a scoop, and was compelled by drainage of vitreous to leave some crumbs of cor-

tex in field of coloboma. Had severe pain first night, requiring anodyne.

November 13: Removed bandage and charpie; considerable secretion from conjunctiva; eyelids swollen; chemosis marked; cornea clear, but aqueous turbid; field of coloboma grayish; tension increased.

Instilled atropia, applied iced cloths, and leeched temple.

18th: Opened wound and evacuated anterior chamber.

29th: Eye remained in condition of chronic iritis for several days, with small hemorrhages into anterior chamber. Discharged with good perception of light.

Case 75.—E. C., 67. Marked premature senile marasmus.

L. E. operated by Graefe's method under ether, section downward, expecting in this way to obviate some of the difficulties of an operation. No accident attended operation, but cornea fell in a crumpled state into empty lenticular fossa. He had excessive, constantly recurring vomiting and retching for several days.

May 17th: Cornea sloughing, and anterior chamber and lenticular fossa suppurating. Soon sympathetic irido-choroiditis of a most painful character occurred in fellow eye, which was cataractous. Enucleation urged, but declined. Patient left Brooklyn Eye and Ear Hospital in a miserable state, and lost all perception of light, suffering exceedingly.

Case 79.—W. J. D., 54, April 15th, 1871. Right eye operated upon, Graefe's method, section upward. Chloroform given. Panophthalmitis set in on day following, sinking the eye.

Notes of cases in which loss occurred after operation by Liebreich's method.

Case 7.—M. H., æt. 40. Blown up by gunpowder fourteen years previously. The accident had destroyed and sunk right eye, but leaving it free from irritability. It had produced a perforating ulcer of the fellow eye, which healed with an extensive leucoma and synechia anterior, and slight synechia posterior. I had made an iridectomy upwards, at that time, restoring useful vision, which he had enjoyed until 1872, when, after receiving a blow upon the eye, cataract supervened, reducing

vision to perception of light. Testing his eye in 1873 for an operation, it was found that the lower portion of the visual field was blind, but whether from detachment of retina or choroido-retinal atrophy, we could not say. He was informed that the chances of a cataract extraction were all against him, but that it might possibly result in some vision.

A Liebreich was attempted, March 12th, 1873. The lens proved to be pasty or waxy, and the vitreous and aqueous commingled, so that the eyeball began to empty itself as the corneal section was made. The lens was removed, however, partly by pressure, partly by the aid of a spoon, and the eyes closed by means of strips of isinglass plaster and a black silk dressing.

March 13th: Some pain during night, but not so severe as to prevent natural sleep. Removed dressings; instilled atropia anterior chamber full.

March 13th, 5 P.M. Pain in forehead. Removed dressings; eyeball plump; cornea hazy; no perception of candle-light. Gave opium and repeated atropia.

8 P.M.: Pain in forehead and eye increased. Gave hypodermic of Sol. Morph. M., m. x., with entire relief of pain.

March 14th: Panophthalmitis, which ran its usual course spoiling eye.

Case 11.—W., 60. A thin and wiry man with sclerosis of all observable arteries. The operation (Liebreich) was without accident, but the eye recovered with a membrane in the pupil, reducing V. to $\frac{2}{100}$. Some weeks later, as V. lessened, the pupillary membrane was needled. This was followed by serous iritis, which yielded slowly to paracentisis, leeches, and atropia. After some weeks patient was allowed to go home. He returned in three weeks, with pupil closed, eyeball somewhat congested, tension minus, perception of light very uncertain.

Case 16. (Liebreich's).—H., æt. 70, farmer. Observable vessels sclerosed. Pupil sluggish. No anæsthetic used. Incision made easily. When the capsule was opened lens would not follow. Wound enlarged, but pupil would not stretch. I then tilted the lens by pressure on the upper part of the cornea, and delivered it by means of a flat spoon. No vitreous lost, nor was there very much violence inflicted. Operation done June 4, 1873.

June 5th: Removed flannel bandage and charpie; considerable conjunctival secretion; cornea transparent; pupil black; incision scarcely discernible; little or no injection of circumcorneal parts. Dropped in Sol. Atrop., and renewed bandage.

June 6th, 6 A.M.: Had severe throbbing, supra-orbital pain during the night, but did not ask for relief. Removed bandage. Conjunctival secretion marked; eyeball red; cornea cloudy. Atropia and iced cloths.

3 P.M.: Tension +. Opened wound and emptied anterior chamber.

Evening: Edge of flap beginning to show necrosis. Applied hot fomentations; gave quinine and tincture of iron.

June 10th: Eye gone by panophthalmitis.

Case 21. (Liebreich) D. B., æt. 64. A very tall, thin gentleman, who had had several severe attacks of bronchitis and been subject to syncopy. Marked sclerosis of radial arteries and other superficial vessels. Eyes known to be myopic and to have posterior staphylomata. Corneal diameter $5\frac{1}{2}'''$. Pupil mobile. The incision was easily made. In finishing the latter the lower margin of the pupil fell in front of the knife and was cut. The lens came out easily, pushing through the wound one or two tags of the cut iris, which were easily removed by the scissors. Every vestige of cortex was carefully removed by gently stroking and pressing the cornea, and without using the spoon, until the pupil seemed under oblique illumination in the focus of a two-inch lens to be clean and black. No vitreous was lost, nor was there any remaining prolapse of iris. Patient counted fingers immediately after the operation on October 22d, 1873. A light flannel bandage and charpie were applied. The patient did perfectly well until the fourth day—26th inst., when at 3.30 A.M. he was awakened by feeling as though he had struck his eye. This was followed by severe pain.

At 10 A.M. the eyelids were swollen, tender to the touch, and there was much circumorbital pain. The eyeball was reddened; the iris pressed forward against the cornea, which was still transparent. The pupil was still clear and not contracted. Atropia was instilled, leeches applied, and after encouraging the bleeding by hot fomentations, iced cloths were placed upon the closed eye and frequently changed. Quinine was given, and

such nutritious food as could be taken. In a comparatively few hours the interior of the eye seemed to be engaged in pyogenic action, and to furnish a free flow of pus, somewhat tinged with blood. Under this inflammatory action the cornea soon sloughed, the eye rapidly diminished in size, painlessly shrinking until it formed a bulb not more than four or five lines in diameter. We were impressed by the rapid diminution of the size of the eyeball. It seemed as though it quickly melted. There was very little pain after the pyogenic action was fairly set up, and at no time was much, if any, inflammatory action in the circumocular connective tissue. It occurred to me that the disaster might possibly be due to atheroma of one or more of the branches of the ophthalmic artery.

A NEW METHOD OF OPERATING FOR STRABISMUS. By J. F. Noyes, M.D., Detroit, Mich.

Besides mere cosmetic considerations, and of paramount importance in operating, is the restoration, when possible, of binocular vision. In striving to do this, the necessary correction of the deviation or squint has always been affected either by a retrocession or setting forward of the tendon by first dissecting it off at the point of attachment or insertion on the ball.

It has also been found necessary in some cases, where the convergent deviation exceeded $3\frac{1}{2}'''$, to perform two or more operations to make the correction, or least a tenotomy upon each eye. But this is not all: by making the tenotomy on the shortened muscle, as is now done, an increased widening of the palpebral commissure is produced, and an unnatural prominence is always given to the eye with a palpable sinking of the caruncle, and this, especially when limited to one eye, results too often in a positive deformity.

Again by disturbing the point of attachment or insertion of the tendon on the globe, there is the risk of disturbing also the vertical meridian of the eye and of producing in the healing and contracting of the wound more or less astigmatism.

In my operation none of these things can possibly take place, since the correction is always effected by *shortening* of the opposing or elongated muscle and without disturbing, also, the point of attachment or insertion of the tendon on the ball.

Essentially the main points or features which are new in the method now proposed to recapitulate them may be stated as follows, viz.:

1st. The correction of the deviation or squint is made only on one eye and by one operation, and is effected without disturbing the point of insertion or attachment of the tendon on the ball.

2d. The tenotomy is made on the opposing or elongated tendon.

3d. The shortening necessary to correct the squint or deviation is made by lapping the ends of the divided tendon, and is applicable to all cases.

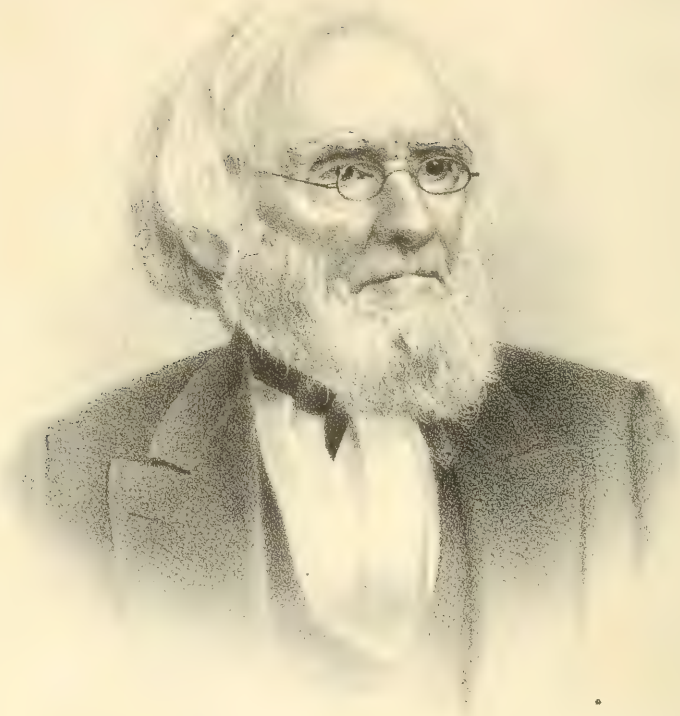
My first operation was made on a girl, æt. 20, March 3d, 1874. Right eye deviation by measurement, 4‴. Strabismus convergent. Eye slightly amblyopic; can make out with it No. 13 Jaeger. Left eye normal; result of operation satisfactory.

The second case, also a girl, æt. 20, was operated on about one month after the first case. Tenotomy on the left eye. Deviation convergent, 4‴. Amblyopic. Reads No. 14 Jaeger with difficulty. Right eye normal; result perfect. A photograph showing same is herewith presented to the society.

The operation is made in the following manner:

The patient being fully under chloroform or ether, the lids secured wide open by a stop speculum, a horizontal incision or slit is made in conjunctiva directly over the tendon, sufficiently long, through which the tendon is lifted out on a blunt hook. The tendon is then divided quite near to its insertion on the ball, leaving enough end or stump so that the other end of the divided tendon can be carried under it lapped and secured by sutures. The amount of shortening thus effected must by actual measurement equal the deviation to be corrected. If it be found necessary to do this a portion from the end of the tendon may be cut off before carrying it under and lapping as already described.

The surfaces of the tendons where they come together in lapping, I need hardly say, should be previously freshened by a knife, or the tendon, if it can be done, may be divided in the first place obliquely. Two stitches or sutures only are sufficient to secure the ends of the tendons thus placed until they grow together, using a curved needle for this purpose; it is passed first through the conjunctiva, and then from beneath through the tendons, thus placed on one side and tied, and then in the same manner on the other side and tied. On the third or fourth day after the operation, or longer, the sutures can be removed with safety.



Dr EDWARD DELAFIELD

TRANSACTIONS

OF THE

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

ELEVENTH ANNUAL MEETING.

NEWPORT, JULY, 1875.

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1876.

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MEMBERS

OF THE

American Ophthalmological Society.

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Dr. Charles H. Williams .....Boston, Mass.
Dr. E. Williams.....Cincinnati, O.
Dr. Henry W. Williams.....Boston, Mass.

Total.....66

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Dr. Isaac Hays.....Philadelphia, Pa.
Dr. R. W. Hooper.....Boston, Mass.
Dr. John Jeffries.....Boston, Mass.
Dr. E. Reynolds.....Boston, Mass.
Dr. C. Schweigger.....Berlin, Prussia.
Dr. George Wilkes .....New York, N. Y.

Total..... 7

Whole Number.....73

AMERICAN OPHTHALMOLOGICAL SOCIETY.

NEWPORT, *July* 22, 1875.

THE Society held its Eleventh Annual Meeting at the Aquidneck House.

The following members were in attendance:

DR. C. R. AGNEW	New York, N. Y.
" ARTHUR MATHEWSON	Brooklyn, "
" LEWIS S. DIXON	Worcester, Mass.
" GEORGE T. STEVENS	Albany, N. Y.
" E. HUTCHINSON	Utica, "
" H. G. MILLER	Providence, R. I.
" J. J. B. VERMYNE	New Bedford, Mass.
" J. H. DIX	Boston, Mass.
" G. HAY	" "
" GEO. C. HARLAN	Philadelphia, Penn.
" C. J. KIPP	Newark, N. J.
" D. B. ST. JOHN ROOSA	New York, N. Y.
" HENRY W. WILLIAMS	Boston, Mass.
" WM. F. NORRIS	Philadelphia, Penn.
" E. WILLIAMS	Cincinnati, Ohio.
" JOHN GREEN	St. Louis, Mo.
" GEO. STRAWBRIDGE	Philadelphia, Penn.
" O. F. WADSWORTH	Boston, Mass.
" T. R. POOLEY	New York, N. Y.
" J. S. PROUT	Brooklyn, "
" OREN D. POMEROY	New York, "
" D. WEBSTER	" "
" A. G. SINCLAIR	Detroit, Mich.
" C. S. FENNER	Louisville, Ky.
" S. F. MCFARLAND	Oxford, N. Y.
" B. JOY JEFFRIES	Boston, Mass.
" C. S. MERRILL	Albany, N. Y.
" RICHARD H. DERBY	New York, "
" H. D. NOYES	" "
" H. ALTHOF	" "
" W. THOMSON	Philadelphia, Penn.

The first session opened at 9.45 A.M. The President, Dr. Agnew, in the chair. Dr. Webster was elected Secretary *pro tem.*, in the absence of Dr. Richard H. Derby. The Chair then appointed a committee, consisting of Drs. Wadsworth, Strawbridge, and Pooley, to prepare a bulletin of papers to be presented: also a committee on the election of new members, consisting of Drs. E. Williams, H. W. Williams, John Green, Roosa, and Norris.

The Report of the Treasurer was then read and referred to an Auditing Committee, consisting of Drs. Pomeroy and Kipp. This Committee reported the Treasurer's account correct, and it was accepted.

The Committee on Membership were by resolution charged with the duty of nominating officers for the ensuing year, and proposing the place of the next annual meeting. The President called the attention of the Society to the death of Dr. Edward Delafield, one of the founders of the New York Eye and Ear Infirmary. Drs. Dix and Williams, of Boston, were appointed by the Chair to prepare for the minutes a notice of Dr. Delafield.

The President appointed Drs. Kipp, Stevens, and Vermyne, a Committee to report a subject for discussion at the next annual meeting.

The Committee on Membership reported to the Society, and recommended for election

Drs. S. F. McFarland	Oxford, N. Y.
" Jno. D. Rushmore	Brooklyn, "
" C. S. Fenner	Louisville, Ky.
" Emil Gruening	New York, N. Y.
" David Coggin	Salem, Mass.
" Albert G. Heyl	Philadelphia, Penn.

All these gentlemen were duly balloted for and elected.

The Committee on Bulletin reported the following order of papers:

A CASE OF NYSTAGMUS ASSOCIATED WITH CONCOMITANT CONVERGENT STRABISMUS, IN EMMETROPIC EYES, RELIEVED BY CORRECTION OF THE SQUINT. By O. D. Pomeroy, M.D., New York.

Margaret Duggan, native of Ireland, aged 33. Since infancy she has had a convergent squint on exclusion by the screen, in the left eye of about four lines and in the right about three lines. She never fixes with the left eye of her own accord. The refraction is emmetropic in each eye.

The vision is $\frac{2}{10}$ in the right, and $\frac{1}{10}$ in the left, or most squinting eye. Signs of an old choroiditis will partially explain the diminution of vision.

Amblyopia from disuse of the left probably explains the poorer vision of this eye. The nystagmus had existed for about five years, and was very troublesome.

It was almost impossible to obtain even a cursory view of the fundus oculi, so constant and rapid were the oscillatory movements of the eyes.

On August 19th, 1873, the tendon of the internal rectus of the left was divided, with partial correction of the position of the eye, but without influence on the nystagmus. Four weeks subsequently, a tenotomy of the internal rectus of the right was done, causing, for the time, a fair correction of the strabismus.

The nystagmus, after a few days, had almost wholly disappeared. As the left eye very soon began again to converge, a second tenotomy of the tendon of the internal rectus was done four weeks subsequent to the last operation. A suture fastened to the conjunctiva, near the external margin of the cornea, and attached to the integument of the temple, sufficiently fixed the eye in a divergent position. The last operation completely corrected the squint, and after a few weeks the nystagmus had completely disappeared. At present (Sept., 1875) the position of the eyes remains correct, and ordinarily there are no signs of nystagmus. If the eyes are turned very strongly to the left, a slight oscillation of the eyes is detected, which immediately disappears on placing the eyes in a more natural position.

As the result of the operation remains unimpaired after two years, it seems fair to suppose that no relapse will occur.

A CASE OF SPONTANEOUS CURE OF SUBRETINAL EFFUSION, WITH AN ANALYSIS OF TWENTY-ONE CASES OF THE SAME DISEASE. By David Webster, M.D., of New York.

Miss M. G., 57, was first seen by me on June 26, 1875. She informed me that both her eyes had been excessively near-sighted from infancy, the right so near-sighted as to have been of little use. She had never worn glasses, because concave lenses sufficiently strong to improve her sight diminished objects to an intolerable degree. Her eyes had never given her any trouble worth noticing, however, until the summer of 1874. She had then been prostrated and confined to her bed for three or four days by "a rush of blood to the head." In the course of this attack her vision became somewhat impaired, and remained in this condition until about two months before I saw her, when it became suddenly much worse. For the last two months she has had appearances like wreaths of smoke passing before her eyes, with occasional flashes of light, the latter being observed only while in the dark. She sees only the lower halves of objects with the right eye.

She has been subject to occasional attacks of facial erysipelas from childhood.

O. D., V. $= {}_{2}\frac{1}{0\,0}$ in lower portion of visual field; no improvement with glasses.

O. S., V. $= {}_{2}\frac{6}{0\,0}$ without glasses; with $-\frac{1}{3\frac{1}{2}}$ V. $= {}_{2}\frac{2\,0}{0\,0}$. Ophthalmoscopic examination with dilated pupils shows a prominent detachment of the lower half of the right retina.

In the left eye are seen large floating bodies, with diffused opacity of the vitreous.

Dr. Agnew saw the patient three days later, and, after a careful ophthalmoscopic examination, confirmed the diagnosis.

She was advised to go to bed, and lie on her back for ten days, having a four-grain solution of sulphate of atropia dropped into both eyes three times a day, and then to come to see us again. She returned on July 19th, stating that she had strictly followed our instructions.

Upon examination we found that there was no longer any separa-

tion of the retina to be seen. The floating bodies in the left vitreous were less, and the diffused opacity had so cleared up that the bottom of the eye could be satisfactorily examined. In both eyes there was extensive staphyloma posticum, with large plaques of choroidal atrophy and exudation. O. D., V. = $\frac{20}{100}$ with -- $\frac{1}{12}$. O. S., V. = $\frac{20}{70}$ with — $\frac{1}{2}$.

During the treatment of this patient by the supine position, the light was not excluded from the room, and she was allowed to partake of her usual food in moderate quantities. She was not permitted to quit the recumbent position for a moment for any purpose. Her general health did not suffer from the confinement, though she complained of feeling "a little weak" when she first rose from her bed.

The following is an abstract of twenty-one cases of detachment of the retina, taken from the case-books of Dr. C. R. Agnew, of New York:

Sex.

Thirteen males.
Eight females.

Age.

Two between the ages of 16 and 20.
Two " " 20 " 30.
Four " " 30 " 40.
Six " " 40 " 50.
Two " " 50 " 60.
Three over 60 years of age.
Two age not noted.

Eye Affected.

In eight cases, right eye.
In ten " left "
In three " both eyes.

Refraction.

One was emmetropic.
Two were hypermetropic.
Nine were myopic.
Four were of traumatic origin.
Five refraction not noted.

Location and Extent of Detachment.

In seven cases the detachment was of the upper portion of the retina.

In three cases the detachment was of the lower portion.

In five cases the detachment was total.

In three cases the detachment was nearly total.

In one case one eye total, the other in the upper half.

In one case the detachment was nearly total in both.

In one case the detachment was total in both.

Causation.

Four cases were of traumatic origin; one was injured with a knitting-needle, one by a pair of scissors, one by a spent bullet, and one by a gunshot wound.

Nine cases seemed to be the result of myopia, with its attendant diseases. In two of these cases there was sclerochoroiditis posterior, with floating bodies in the vitreous of the fellow-eye; in two, floating bodies in vitreous of fellow-eye; in three, staphyloma posticum of fellow-eye; in one, cataract of fellow-eye; in one case, in which there was detachment of both retinæ—one three years later than the other—there were old opacities of both corneæ; in one the detachment occurred in one eye two years after it occurred in the other.

Two cases were hypermetropic. The notes of these cases are as follows: Mrs. A. H. B., 42, fourteen years ago had severe neuralgia of head, face, and eyes. Eyesight began to fail two and a half years ago. First symptom, diplopia.

O. D., V. = $\frac{5}{200}$ without glass; with, + $\frac{1}{15}$ V. = $\frac{20}{60}$. O. S. detachment of retina nearly total.

D. B. W., 23, medical student; one year ago, while reading in the morning, both eyes became suddenly and totally blind for a few moments. Was perfectly conscious at the time, and had no pain, vertigo, or other disagreeable feeling. The sight returned at once to O. D., which has not troubled him since, except by a couple of black spots which lately appeared. The sight partially returned to O. S., but it gradually became worse until he lost all perception of light.

O. D., V. = $\frac{20}{20}$; Hm. $\frac{1}{45}$. O. S. total detachment of retina.

One was noted as emmetropic, with vision $\frac{20}{20}$ in fellow-eye. The following is her history: Miss M. B., 34, four months ago discovered

suddenly that her left eye was nearly blind. Never had any trouble with either eye before. Has long been subject to headaches, which settle in the back of her head, and are very intense. These attacks are brought on by any undue excitement. Has always been in the habit of taxing eyes severely in doing embroidery and other fine work.

Five cases are without notes of refraction. The following short sketches of their histories may be of interest:

J. B., starch manufacturer, O. S. vision lost one and a half years ago by iridochoroiditis; T—; lens opaque; total synech. post. with bulging of iris; no perception of light. O. D. was good up to last Friday morning, when, while brooming out grain in a canal boat, in the early morning, the vision of that eye grew bad so rapidly that when he came out of the boat he could scarcely make his way about.

Eliza M., 36, ten years ago O. D. became blind gradually; no perception of light; pupil elongated vertically; lower half of iris bulged forwards by opaque white mass pressing against it from behind. O. S. saw well up to three months ago, when it became almost blind in the course of a day. The detachmment is almost total.

J. H., 66, merchant, twenty months ago O. D. became suddenly blind, and seven months ago O. S. became blind in the same way. Cannot count fingers, but can tell the time of day on his own watch with the sun shining directly upon it. Can make his way about the streets on a bright morning. Detachment of the retina, with floating bodies and incipient cataract, both eyes.

Bridget R., 50, detachment of the upper part, O. S. came on in the night and was first observed in the morning.

M. M. J., upholsterer, four weeks ago noticed a blur in lower part of right eye. When he awoke the next morning the obscuration of vision was much increased. Detachment of the upper third.

In all of these cases an unfavorable prognosis was given, and very few of them were seen a second time. Two were treated unsuccessfully by the recumbent posture. One man, a farmer, in whose eye the detachment had existed for six months, kept his bed for six weeks without improvement; another, a student, lay on his back four weeks and rose with vision unimproved.

Dr. Wadsworth.—*Mr. Chairman:* I also have seen a partially separated retina become replaced, but without treatment by the recumbent position. The patient was a lady of 36 years, a teacher, unmarried. In April, 1874, she came to me with a

central retinitis and central scotoma in the right eye. She was very nervous, depressed, complained of wakefulness, and indefinite unpleasant feelings along the spine, etc., but was in fair flesh and strength. Under rest of the eyes and tonic treatment the retinitis and scotoma disappeared, and the nervous symptoms became less. In the middle of June V. in the right eye was $\frac{15}{20}$. During the following summer she was in the country, and had no trouble with her eyes, but in September she went to a water cure in Western New York, by advice of friends, on account of "distress" in her head. There she remained some two months, fasted and was packed, and was directed to sit quietly after meals, as long as possible with the head bowed forward on the breast. She did sit in this position some two hours daily. She returned home on discovering that vision of the right eye was again failing. A week later I saw her. There was again a central scotoma, and a separation of the retina, of small extent, just below the region of the macula. While the retina, just outside the disk, was seen clearly with -16 (upright image), the summit of the separated portion was seen clearly with $+24$. Her condition precluded entire rest; she "was so nervous that at times she felt as if she would go crazy." Moderate exercise in the open air, avoidance of stooping or inclination of head, attention to diet, etc., and, of course, non-use of eyes were advised. A week later the separated retina had gone back into place, and was now seen with the same glass as the retina to the outer side of the disk, *i.e.*: -16. During the next month the retina remained in position, and V. gradually improved to $\frac{15}{64}$. I have not since seen her.

Note.—November, 1875.—I have recently learned that the patient went back to her school in February, 1875; did well for a while, and then broke down from nervous depression, but without complaint of her eyes. She is now at an establishment for the treatment of nervous diseases, and the physician in charge writes me that she can read the heading of "*The Nation*" at 18′, and has no difficulty in reading fine print with the right eye.

Dr. E. Williams.—I have operated but once in a case of detachment of the retina, and the result was not at all encouraging. I do not believe that long confinement in a dark room on the back, or any other treatment for this unfortunate condition, does much, if any, permanent good. I was anticipated in

the operation in one case. A farmer from the country called with a large recent detachment above. I proposed an operation, which he decided to have done after a few days. Before returning, however, he was struck on the eye by an ear of corn, and soon after there was a perceptible change in his sight for the better. When he came again, I found that the retinal bag had been ruptured, and the detached portion appeared to be returned to its connection with the choroid. The vision in the lower part of the field had improved.

Dr Strawbridge.—I have recently seen a case of retinal separation. The patient was a girl of sixteen. The left eye, which was highly myopic, had been blind for a year from total separation of the retina.

The retina of the right eye, ten days before my examination, had commenced to separate in the upper temporal quarter, as could most distinctly be seen with the ophthalmoscope. There was entire failure of the corresponding portion of the visual field. With this eye she could read Jäger No. 11 with great difficulty. I made the Bowman operation for her relief. With two needles, introduced through the sclera, in its upper temporal quarter, a free incision or tear was made in the retina. This was followed immediately by a large subconjunctival chemosis. The next day showed the retina entirely replaced, and visual field perfect. Vision was greatly improved. At the present time, five weeks after the operation, patient can read Jäger No. 2, and there is no return of the trouble.

Dr. Mathewson.—I have lately seen a case of separation of the retina, resulting in recovery. Mrs. W., æt. 50, was brought to me by her family physician, on account of defective vision of the left eye, on September 14th, 1874. August 7th, she had experienced unpleasant feelings about the head and eyes, as of approaching sick headache, and a short time after discovered that the sight of the left eye was affected. The ophthalmoscope showed a detachment of the lower and outer parts of the retina, so prominent and well marked as to admit of no doubt in the diagnosis. There was a corresponding limitation in the field of vision, which was everywhere very indistinct. The eye was emmetropic. An unfavorable prognosis was given. The patient was not seen again until May 14th, 1875, though I

had learned through her physician that her sight had greatly improved. It was found on examination at the above date to be $\frac{20}{L}$, and with $+\frac{1}{36}$ she could read No. 4 of Jäger with ease. The retina had regained its normal appearance. There was no visible indication of any rupture. The history of the case, from the time I had first seen it, was that vision had gradually grown worse, and the field more limited, till she could only see the floor and objects a foot or so above it. This condition continued for two or three months, when she began to use dry cups to the temples, very frequently allowing them to remain on for hours, as they seemed to relieve an unpleasant feeling about the eye. Wet cups were also applied twice a week. These means were employed persistently for months. After a time her vision began to improve, and has continued to do so.

She was last seen by me July 19th, when her vision was slightly better than at the last previous examination. The field of vision was still somewhat limited at the upper nasal side. The patient had not at any time strictly maintained a reclining position.

Dr. Kipp.—In regard to the treatment of retinal detachment by the recumbent posture, my experience has led me to believe that it is not devoid of danger to the patient's general health. Some years ago I tried this treatment in the case of a robust-looking man, of active habits, about fifty years of age, whom I saw a few days after the impairment of vision had been first noticed. The retina was detached in the lower half in both eyes. There were no signs of an inflammatory affection in either eye. There was no myopia. The closest examination failed to discover disease of the kidneys or liver. The patient was kept on his back in a moderately dark room for about three weeks. Atropine was used for the purpose of paralyzing his accommodation. A few leeches were applied to his temples on the second day of the treatment, and fifteen grains of the iodide of potassium were administered daily. This treatment was not attended by the slightest improvement in his eyes, but broke down his general health to such a degree that for several months subsequently he was hardly able to move about, and he has been in feeble health ever since, his family firmly believing that it is due to this treatment.

RARE CASES, WITH PRACTICAL REMARKS. By E. Williams, M.D.

Mrs. A. L., a Frenchwoman, æt. 35, mother of three children, all with good eyes, was examined March 26, 1875. Of seven brothers and sisters, two have peculiar eyes, one of whom I saw with her, and will give his case below. Till three weeks ago she had always read and sewed with the right eye without glasses. The left had always been very imperfect. Three weeks ago the good eye was injured by a blow from the hand of her child. Sight was immediately and seriously impaired, and so remains.

Status præsens: R. e. iris darker colored, with traces of blood in bottom of anterior chamber, and trembles freely on the slightest motion. Pupil medium in size, and slightly movable. V. = fingers at three feet; lens clear, but slightly luxated downward and outward, which could only be detected positively by dilatation of the pupil. Moderate ciliary injection and slight photophobia, with weeping, and tenderness to the touch.

L. e. lens luxated downward, shrunk, and quite white. V. = fingers at one foot, and slightly improved by + 2½ glass. Pupil in both eyes but very slightly eccentric upwards. Ordered atropine and perfect rest. Have heard since that the eye is better, but nothing further. It is probable that the lens in r. e. was dislocated by the blow, as up to that time she had always read with it without glasses. It may have been out of place before, or if it was not, there was a predisposition to displacement, as indicated by the condition of the other eye and the family history.

The brother, L. B., who accompanied her, aged 30, presented the following curious conditions: As I published a detailed description of this case some three years ago, I will only state his present condition, and the changes that have occurred since his visit at that time. He is a well-developed, stout laborer. The eyes are of a very light gray color, and present the peculiar appearance which light-colored eyes show when under the influence of the calabar bean. The pupils are very small, oval, and very eccentric upward and outward, being partly covered by the upper lids. But a few fibres of iris intervene between the pupil and periphery of the iris. The long diameter of

the oval pupils is in the direction of the eccentricity. They respond promptly to light, and when contracted are almost invisible at the free margins of the upper lids. Under atropine they dilate to about twice their usual size, and become more circular.

The trembling of the irides is so striking as to be noticeable at several feet, and the chamber very deep.

R. e. Lens not visible except under atropine, and so far as can be seen, clear. Its upper edge presents in the lower part of the pupil occupying less than one-fourth of its area. Vitreous and fundus clear, and no alteration, except a slight staphyloma posticum. V. = Snellen $2\frac{1}{2}$ with $+ 2\frac{1}{2}$. In this eye, when I saw him three years before, the lens occupied two-thirds of the pupil, and he had troublesome diplopia monocularis, which induced him to come for consultation. Without a glass he fixed his attention on the image through the lens, but with it, the other was sharp and clear. In the left eye, at that period, the lens presented about as much in the lower edge of the pupil as that of the right does at this time. Now it is invisible, being entirely out of the pupil, and only slightly seen by looking downward and backward behind the iris, and appears clear. Vision in this eye much improved by convex 4 for distance, and $2\frac{1}{2}$ for reading. He sees to work perfectly well, however, in ditching, etc., without any glasses. I scarcely need say there was no coloboma of the ciliary body or choroid.

The two following cases of spontaneous luxation of the lenses, also in brother and sister, present some points worth reporting. Mary J., æt. 28, single, consulted me July 17, 1875. Eyes slightly divergent, pupils small and sluggish, irides trembling, and of a bleached, dirty gray color; chambers deep. Her eyes have been about equal till within the past few weeks, when she noticed a glimmering before the right, and a curtain dropped down from above, nearly cutting off all vision. All qualitative perception is abolished in the field of vision, except below where she counts fingers near the floor at three feet. Eye slightly injected, and sensitive to light and touch; tension 1, and she complains of the constant glimmering before that eye.

Pupil small, central and round, but does not dilate much with atropine. The lens, semi-transparent, is dislocated *upwards*, leaving about one-fourth of the pupillary area clear. The lower edge tilts backwards in vitreous, while the upper seems to rest against iris and push it slightly forward. With ophthalmoscope, red reflex above, but bluish-gray appearance below, indicating detachment of the retina; fundus invisible.

L. e. luxation *upwards*, and two-thirds of pupil free. Lens transparent, but appears small, the lower edge also presenting backward, and the upper pushing iris slightly forward. No double vision. V. $= \frac{15}{200}$, and with + 7 $= \frac{15}{40}$. She reads Snellen 1 with + 4½ at six inches. Could see fundus dimly; but as I did not wish to put anything in this eye atropine was not used. The father's eyes were like theirs, but their mother and only brother had good eyes. In her right eye the irritation and detachment of the retina came on without trauma, confirming the well-known fact that all such eyes are liable to blindness from disease of fundus, and especially from detachment of the retina. The patient says she has always been a great reader by the aid of glasses, which she did not have with her. Her brother, Marcus J., æt. 26, large and *loose-jointed* like his sister, brought her to see me, but had NOTHING the matter with his eyes, always having seen PERFECTLY, as he declared. A marked divergence of his eyes and their peculiar expression attracted my attention, and I noticed that he stuttered. On inspection I found the same deep chambers, trembling irides, pupils small and central, but pear-shaped; the points presenting downward, and sluggish. L. e. V. $= \frac{15}{1000}$, and improved to $\frac{15}{20}$ + with + 7. R. e. V. $= \frac{15}{2000}$ and $\frac{15}{50}$, with + 7. Divergence 3 lines, the patient fixing usually with the left eye, with which he reads Snellen 1 with + 4½. Both lenses are displaced upward, the right slightly inward. When eyes are horizontal the lower edge of each lens comes below the centre of the pupil, but he has no diplopia. Lenses a little hazy and reduced in size. Field of vision perfect in both eyes.

BASEDOW'S DISEASE.

Without discussing the causal connections and origin of the three peculiar symptoms of this disease, and without tedious details of cases, I refer only to two for their practical importance. One was a woman of 35; widow; small, delicate, and of a highly nervous temperament, with extreme exophthalmus, goitre of medium size, and pulse habitually from 120 to 140. The attack followed the distressing illness and painful death of her husband some years before. She was the mother of a healthy girl of ten years. When I saw her she was very much emaciated, and presented in all respects a most pitiable condition. But most of all, she was mortified by the frightful appearance of the eyes, for which she alone asked or expected relief. I made Graefe's operation of closing the lids for half an inch at the

outer commissure in each eye, without ether. She bore it well, and I closed both eyes with a wet compress and bandage.

Next day the lids were united and doing well. The following day the right eye began to show chemosis and haziness of the cornea, before perfectly clear. I strapped the lids together, and kept the cornea covered as well as possible for two days. But the destructive infiltration of the cornea, commencing in the centre, went on from bad to worse till the whole cornea sloughed in the course of a week. On the third day I removed the stitches from both eyes, and the lids remained adherent. Two days after this destructive inflammation set in, the left eye began and went the same way, although I completely closed the lids after the second day with sutures passed through folds of the skin in the upper and lower lid, and tied across the margin. As the eyes continued to pain her severely and to suppurate, her general condition, in spite of the most faithful nursing and treatment, grew worse and worse, and she died about four weeks after the operation. In this instance certainly the operation hastened the fatal termination.

I was overpersuaded by the patient, although the eyes were only slightly injected, sensitive to the light and watery, but the corneæ perfectly natural. For that reason there was no urgency, but the patient was willing to suffer and run the risk solely to be relieved of the staring deformity. In a similar case I should never operate again, unless trouble in the cornea had set in.

Another woman, 40 years of age, large and rosy, and of fine personal appearance, presented herself about the same time for treatment. She also was a widow, whose husband, after a protracted illness, died of fearful convulsions some years before. The disease developed suddenly at that time. She had a small goitre, pulse varying from 100 to 120, and the eyes very prominent. Still she could close the lids by an effort, and there was no inflammation of the conjunctiva or corneæ. She wished to be relieved of the deformity of the eyes. Although extremely nervous, and ready to fly to pieces under the least noise or sudden excitement, I decided to operate. The operation was performed without ether, and she bore it well. The lids united nicely, and her appearance was marvellously improved. But on the second day after the operation the eyes became injected, sensitive to light, with slight chemosis, and a large phlyctenular patch on the limbus conjunctivæ at the outer commissure in each eye, the right being worse. I immediately removed the stitches from both eyes, and detached the lids slightly in the right eye. Under the use of

frequent instillations of atropine, keeping the eyes closed with a wet bandage, and perfect rest for over a week, the threatening inflammation subsided, leaving only a very slight marginal haziness of the right cornea. On being discharged she was going to Boston, and I advised her to consult Dr. Clark, which she did, and was under his treatment for some months with decided improvement of her general condition. I saw her some months after her return from Boston. She was still better, eyes appeared very well, and the exophthalmus scarcely noticeable, but the pulse was still 120.

I believe that the pressure of the narrowed commissure in both these cases caused strangulation and the consequent inflammation. In the fatal case the nutritive powers were at a low ebb, and the slightly increased pressure strangulated the corneæ. In the other case the conjunctival and corneal trouble were concentrated at the outer margins corresponding to the rigid commissures. If I make this operation again I shall pare and close the lids in the centre as well, so as to be sure of keeping the eyes closed, distributing the pressure and guarding against danger to the cornea. After a few days, when the eye is accustomed to the new conditions, the central adhesion might be detached with safety. In extreme prominence of the eyes, the least swelling of the conjunctiva after the operation makes it impossible to close the lids and keep them closed perfectly under the bandage with strips of plaster or any other means than stitches. Little by little the cornea will press forward, separate the lids, and come in contact with the dressing.

ANÆSTHESIA RETINÆ.

Out of a number of cases of retinal anæsthesia, treated during the last year, I shall only report briefly a few, some for the prompt and satisfactory manner in which they yielded to treatment, and one for its obstinacy.

Case 1.—Miss S., æt. 24, a healthy and vigorous person, without any known cause, became suddenly blind May 8, 1874. After a few moments the sight returned, but only for objects directly in front. During the next two days these blind attacks returned several times, lasting a few seconds and then passing off, the oblique vision remaining, however, all the time imperfect, the fields being much contracted. The next day, on examination, we found V. = $\frac{2}{3}\frac{0}{0}$ in both eyes, but on fixing the letters a few moments they and the entire board disappear till she rests. Field of vision at 2 feet: R. e. contracted to $3\frac{1}{2}''$ in the vertical, and $3\frac{1}{4}$ in horizontal diameter, and l. e. $4\frac{1}{4}$ vert. and 5 horiz.

Pupils of medium size and active. No disturbance of menstruation or other cause to account for it. Treatment: Subcutaneous injection of strychnine $\frac{1}{40}$ of a grain. May 10. Both fields slightly enlarged, r. e. 5″ in both vert. and hor., and l. e. $5\frac{1}{2}$ hor. and $4\frac{1}{2}$ vert. Strych. gr. $\frac{1}{30}$. May 11. R. e. 7″ in both meridians, and l. e. 8″. The blind spells do not return. Strych. $\frac{1}{30}$. May 12. 9″ vert. and 10″ hor. l. e., and 8″ in both meridians r. e. Strych. $\frac{1}{30}$. Saw patient no more till the 19th. At that time r. e. vert. 14″ and hor. 15″, and l. e. hor. 16′ and vert. 15″; has had no more sudden blind spells since last visit. Strych. $\frac{1}{30}$. After this she recovered entirely in a few days, and on July 1 says she has remained perfectly cured. The fact of the sudden occurrence of the disease in a perfectly healthy person, without any known exciting cause, is a peculiar one.

Case 2.—Mrs. H., æt. 38, fine and large personal appearance, but of a very nervous temperament, was married young, and had been the mother of eleven children at the age of 28 years! Two years ago she lost a child from an overdose of morphia administered by her by mistake. This has preyed on her happiness ever since. For some years her husband has been a paralytic, and a constant trying charge to her. She is also subject to chronic dysentery, with acute attacks frequently of great severity. April 13, 1874. She complains of asthenopia. She can only use her eyes for close work a few minutes at a time, and always with pain. She has a M. apparently of $\frac{1}{4}\frac{1}{2}$ and V. = 1. She was not then willing to submit to the test by atropine. Ordered tonics and rest of the eyes. May 23. Returns worse than before. Atrop. (gr. iv. to ℥ i.) two instillations. Find H. $\frac{1}{4}\frac{1}{2}$. Ordered glasses for constant wearing. Two weeks later patient returned. Has been much reduced by dysentery, and complains of momentary attacks of total blindness, and cannot feel safe in walking alone, because she cannot see objects at the sides. She now has extreme photophobia. Ophthalmoscope shows no change. Fields both contracted to 8″ vert. and 6″ hor., and V. = 1.

Sent home to her physician to have hypodermic injections of strychnine. These could not be tolerated, for the nausea and headache which they produced. After this she made several visits at irregular intervals, the vision and fields remaining about the same. Then she ceased coming till March 31, 1875, nearly a year after the first visit. Then her right field was diminished to a circle of 2″ diameter at two feet distance. Reads No. 2 Sn., but only sees two letters at once. In the word *not*, only sees, the *no* at once. L. e. field normal, but V. = only $\frac{1}{5}\frac{8}{0}$, and with + 42c. = $\frac{1}{4}\frac{8}{0}$. Fundus of eyes

normal. Tried strych. injections, but she could not bear them as before. Gave quinia, iron, and other tonic treatment. June 5, 1875. Has intense photophobia, and fields extremely small; l. e. 1½″ hor., and ½″ vert. and r. e. 2″ hor. and 1½ vert. (always at two feet). We again tried injections of strych. $\frac{1}{60}$ grain the first time, and $\frac{1}{50}$ every second day. The first two caused no nausea or vertigo. Since that time we have not seen or heard how the patient is. For some weeks before the last visit her fields remained very small, and she did not venture to leave the house alone. She suffers often with violent attacks of dysentery still, and her eyes are always worse at those times, and better when her health improves.

It has now been over fifteen months since we first examined her, and her condition is much worse than at that time. It shows how persistent the disease may prove under the continuance of the many and aggravated causes to which she is subject. The strychnine treatment could never be used with any regularity, or indeed any other, and it is very questionable whether, with the painful dysentery and other numerous sources of mental and physical depression under which she is called to struggle, she will ever recover.

Case 3.—J. L. W., æt. 10, a delicate, nervous boy, with the following history: On the morning of April 11th last, he awoke and found he could scarcely see to recognize persons. He suffered no pain in the eyes, and thought that the dimness would soon pass away. Went to school as usual, but could not see to study, and returned home. His vision has remained about the same to the date of his visit to us, April 22. He has been subject to headaches through the temples for a year or two. Though of slender figure and anæmic look, his general health has been good. He is bright and intelligent, and answers questions promptly and satisfactorily. No muscular or other disturbance like chorea. At present he can only count fingers with r. e. at six feet, and not certainly at any distance with the left. The field of vision is contracted in r. e. to 6″ vert. and 12″ hor., at twenty feet distance, and in l. e. 2″ vert. and 6″ hor. He cannot tell his father from any other man, except by his size. Pupils moderately dilated but active. Fundus of eyes sound. 11 A.M. injected $\frac{1}{50}$ grain strych., and saw the patient again at 4 P.M. At that time the field was *complete in both eyes.* 23d, 9 A.M., reads letters No. 70 at 4″. Second injection at 4 P.M., read No. 30 at 3″. 24th. Third injection morning, and examination at 3 P.M.; reads 20 at 3″. Reach of vision better; could see a man in the adjoining lot, at about 50 feet.

25th. Fourth injection $\frac{1}{40}$ grain; reads 12.

26th. Sixth injection; reads 8 slowly.

28th. Seventh injection $\frac{1}{30}$; reads 8 readily.

29th. Eighth injection; reads 6 slowly.

30th. Ninth injection; reads 5 slowly.

May 1. No injection; reads $1\frac{1}{2}$ Sn. at $3\frac{1}{2}$ inches. Sight about equal in both eyes. Went home, and was ordered $\frac{1}{30}$ grain strychnia once a day internally. May 24. Returned. V. = $\frac{15}{20}$ nearly in both eyes, and he could read 1 Sn. slowly. June 22. Vision improved to more than $\frac{15}{20}$, and reads 1 Sn. rapidly.

No news from him since. This case, though very severe, recovered rapidly, the remarkable influence of the first injection in completely restoring the field of vision being perhaps the most interesting observation.

BINOCULAR TEMPORAL HEMIOPIA.

Frank H., æt. 44, fireman, and a large, robust, healthy-looking man. He has had frequent attacks of vertigo for some years, and unsteadiness in his gait at times. Six years ago he had several epileptic attacks, but has been free from them for four years. Has not complained of much headache, but of severe pains in the back of the neck coming in paroxysms. Has nausea frequently, but no vomiting. Memory impaired at times. He was examined by us July 23, 1873. The autumn previous patient first noticed that his left eye was defective. On closing the other he could only see the half of objects directly before him. During the past spring the right eye was becoming similarly affected. On examination with the ophthalmoscope there are no marked changes in the fundus of the eyes—no symptoms of atrophy—disks clear and sharp, of natural color. The veins alone appear a little tortuous. Tested with the candle there was a total loss of perception in the outer half of each field of vision, divided by a vertical line nearly through point of fixation.

Evidently the inner half of each retina was insensible. The patient returned a few times in the next two weeks, with the same symptoms. But as we could not promise him a certain cure he disappeared, and I have not been able to get track of him since, much as I longed to see his brain. He lived in a neighboring village, and has probably died. In this instance the lesion must have existed at the anterior part of the optic chiasm, between the roots of the optic nerves.

STRABISMUS WITH RIGIDITY OF THE MUSCLE.

Four cases of this kind have come into my hands, three of them within the past year.

Case 1.—A child, 21 months old, was brought to me in Sept., 1872, for *extreme* convergence of the eyes. In fixing objects the child was obliged to turn the head to one side and look across the nose, fixing with the opposite eye. The motion outwards was very limited, but difficult to establish in a patient so young and intractable. Each eye seemed to be constantly drawn toward the nose, and almost fixed. Under ether I made a double tenotomy, but with unusual difficulty. On seizing the eye to draw it outwards it could not be brought to the median line, and came suddenly to a stop, as though checked by a rigid cord. I found great difficulty in getting the hook under the entire tendon, and had to detach it with repeated and careful cuts with the points of the scissors.

The contraction and rigidity were about equal in both eyes. The mother stated that it was *born* with a marked convergence of the eyes, which had gradually increased till the date of the visit. There was no evidence of cerebral disease having existed in utero, and the child was in all respects healthy.

The immediate effect of the operations was very satisfactory. The eyes seemed to stand naturally for objects directly in front, but there was no *motion* either inwards or outwards, the child supplementing the absence of rotation by movements of the head, as indeed before the operation. The cosmetic effect, however, was excellent. The case did well, and the following statement of the mother, in a letter dated July 12th, 1875, will explain its present condition: "We think our little girl's eyes are now very nearly, if not quite right. They are almost perfectly straight, and she sees well out of both. When not well or sick, she does not seem to have so good control over them, the right eye at such times turns up in her head a little. We think, however, she never turns them in, and although her eyes appear perfectly natural and not at all fixed, yet she almost always turns her *head* from side to side, and *not the eyes*, in looking about her. By fixing her head, I can make her turn the eyes to either side, but they seem limited in both directions; not so much, however, as when you last saw her, about three months after the operation."

Case 2.—F. A., æt. 6 years, has convergent strabismus of about 3½ lines, the motion outwards being very much limited. It was impossible to test the vision accurately, as the child had not learned to read. There was evident amblyopia and want of mental development.

My partner, Dr. S. C. Ayres, made the tenotomy on both eyes, but with much trouble on account of the unyielding state of the con-

tracted muscles. By engaging the end of the hook under the edge of the tendon, and snipping little by little, pushing the hook further each time, he succeeded. Immediate result very good, but we could not test the movements, and have not heard from the case since the following day. On the same day we tenotomized the internal recti of his little sister, where the muscles presented the normal elasticity.

Case 3.—A young lady of 17 years had a convergence of the left eye *since birth*, as her mother distinctly remembers. The degree of deviation had increased till I saw her two months ago. The cornea, when she fixed with the other eye, was half hid behind the caruncle. She could not rotate it outwards quite to the centre of the commissure, and the eye was very amblyopic, she being only able to count fingers at three feet.

The other eye was perfect in all its movements, emmetropic, and vision 1. No appreciable change in the fundus of the eye, but it was difficult to examine on account of the great convergence. I operated without ether. On attempting to draw the eye outward it came to a sudden solid stop near the median line, and I felt at once that I had a rigid muscle. With hard work I got the hook under the tendon and tried to cut it off between the hook and sclerotic as usual. The tenotomy was exceedingly difficult, and when the tendon yielded suddenly to the last snip of the scissors, I saw a clear drop of vitreous at the bottom of the incision. The eyes were closed immediately with compress and bandage, and the patient put quietly in bed. For four days I kept her on her back, with the eyes closed and the compresses constantly wet with cold water. At the end of forty-eight hours I opened and examined the operated eye; I found it straight, but fixed, and looking very well. She recovered without the slightest pain or trouble, and is exceedingly well pleased with the improvement of her appearance. The pupil, slightly drawn towards the sclerotic wound at first, is now central, circular, and active as before. She says her sight is even better than before the operation. The eye is now but very slightly convergent when the other is directed in front, with no motion outward or directly inward. On trying to turn the eye inward the cornea turns upward and inward a little, but at the same moment the ball is retracted fully two lines into the orbit, and in that position the lids nearly close! In all other positions it is well open, but appears a little smaller than the other, as it was before the tenotomy. By looking with the ophthalmoscope inward and far forward, I could see a patch of choroidal atrophy, with the retina over it of a bluish-gray color.

These were undoubtedly changes produced by the perforation of the sclerotic, but I was most happy to see no more serious damage to the eye. I do not detect any detachment of the retina, and it remains to be seen if any further change ever occurs. In view of the extreme difficulty in severing the tendon in *such cases*, I shall in future make the incision of the conjunctiva directly over the tendon, and either use forceps to seize and raise the tendon, or cut it off externally to the hook.

Since writing the above I have had another case, in a boy five years old. Both of his eyes were rigidly, immovably drawn far inwards, and he rotates his head instead of the eyes. I operated on one eye, cutting the tendon externally to the hook, after making a free conjunctival incision directly over it. The eye now stands straight forward, but immovable, and the other converges as it has since birth. I shall operate on the second eye in a few days, and probably in the same manner.

OPHTHALMIC CONTRIBUTIONS. By Dr. Geo. Strawbridge, of Philadelphia.

I. HYSTERICAL BLEPHAROSPASM, TREATED AND RELIEVED BY FORCIBLE ELEVATION OF THE EYELID.

The patient, a young lady æt. 22, of delicate health, and troubled with some menstrual irregularity, one year ago suffered from a sudden loss of voice, which was treated as a hysterical condition, with marked improvement. Six months after this occurrence, on awakening one morning she found it impossible to raise the eyelids, and at the same time considerable photophobia and lachrymation existed.

This condition lasted some days, and she then found it possible to slightly raise the left eyelid (no doubt owing to the great inconvenience of being entirely deprived of sight). This slowly increased until perfect motion was again restored to the left lid; but the right lid remained tightly closed, and the greatest effort at elevation resulted in an irregular twitching, without the least tendency toward opening.

By exclusion I was entirely convinced that here was a case of pure hysterical spasm.

After exhausting different methods of treatment without success, I determined on forcible elevation of the eyelid, by the plan proposed by Dr. Mathewson in the last year's Report of this Society, namely, by means of a gum band fastened to the skin of the eyelid, and also to the forehead.

The great difficulty in securing firm attachment of the rubber to the skin induced me to substitute a band of adhesive plaster, one end of which was firmly attached to the skin of the lower lid, and by traction the lid gently raised and held in position by securing the upper end of plaster strip to the skin of the forehead. This did not entirely prevent the lids from closing, and the patient submitted to the appliance very cheerfully.

The band at first was reapplied every day, the lid spasm continually lessening under the treatment, as well as the photophobia and lachrymation. Afterward, several days elapsed between the renewals of the band.

The moral effect was quite as great as the physical one. On several occasions, when the band had become detached without the knowledge of the patient, the lid elevation still continued, although the moment the plaster was intentionally removed the spasm at once showed itself.

This treatment, continued over several weeks, entirely relieved this curious condition.

II. FOREIGN BODIES IN THE EYEBALL.

It is most interesting to observe the number of cases that present themselves with severe injuries of the eyeball caused by penetrating foreign bodies, and where often for years they have remained without causing much apparent injury.

Case 1.—*Represents a foreign body* (iron splinter) *remaining now for two years in the sclerotic coat of an eyeball* without causing any great degree of reaction. The right eye of a man, æt. 25, was struck by a steel splinter, penetrating through the sclerotic near the tendon of the internal rectus, and passing across the vitreous humor without injury to the lens, and lodging in the sclerotic slightly outward and downward from the papilla. The ophthalmoscope revealed the following changes:

Outward and downward from the papilla was seen a large circular space, entirely white, evidently the bare sclerotic, in the centre of which was noticed a *small black object* the size of the head of a large pin, probably the iron splinter, although no metallic lustre was evident; but the entire absence of choroidal pigment at this place made it most probable that the black object was the iron splinter.

Around this white space choroidal degeneration was noticed. The vitreous humor was fluid and full of floating opacities.

V. = $\frac{20}{50}$, and marked defect in the central visual field. No irritation existed in either eye, and the man was constantly employed in his occupation of machinist.

Case 2.—An eyeball injury caused by an iron splinter passing through cornea, iris, and lens, and lodging in the sclerotic a line outward from the papilla. The accident happened ten years previously, and was followed by a cataract formation and a severe attack of irido-choroiditis. After a duration of several months this subsided, and for three years the eyeball remained quiet; then a second similar attack occurred, lasting a short time, and followed by a four years' interval of rest. A third attack, of similar character, and a three years' interval of quiet, was succeeded by a chronic irido-cyclitis, which, on account of sympathetic irritation of the second eye, rendered its removal neces-

sary. The iron splinter was found firmly embedded in the sclerotic, one line outward from the papilla, and the interior of the eyeball filled with the products of the previous inflammatory attacks.

Case 3.—An iron splinter encysted in the conjunctiva and sclerotic for twenty-one years, without the least injurious effect.

In this case the splinter struck the eyeball at the insertion of the rectus internus tendon, and partially buried itself in the sclerotic. This happened twenty-one years previously, and was followed by a slight inflammation, which quickly subsided; since then absolutely no inconvenience had been experienced.

Status Præsens. V. = 1. Eyeball is in entirely good condition. The iron splinter can be plainly seen embedded partially in sclerotic and partially in the conjunctiva. It can be grasped with a forceps, and is very adherent; no irritation exists, and the man will not consent to its removal.

These three cases are noteworthy, on account of the long time the foreign body remained in the eyeball, with but comparatively little suffering to the patient.

Case 4 was a recent injury.

The iron splinter passed through the cornea and lodged in the iris.

Examination twenty-four hours afterward revealed a clear lens and vitreous humor, but irregularity in the shape of the iris at the place of lodgment of the splinter.

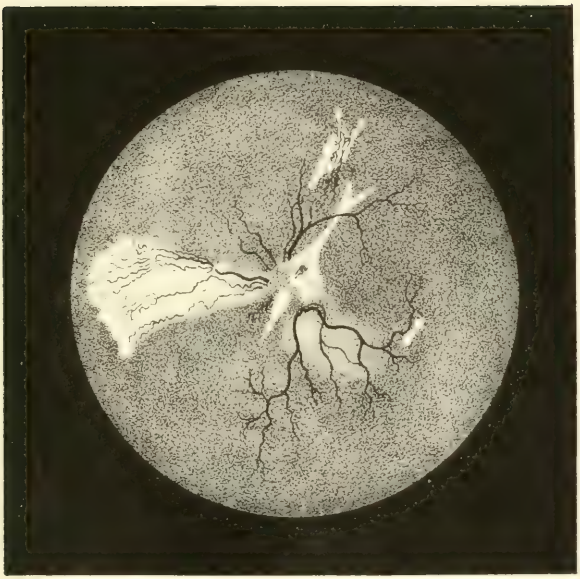
The iron splinter could be clearly seen. By making a small iridectomy at the point of iris irregularity I was lucky enough to also remove with the piece of iris the iron splinter. This was followed by complete recovery of the eye, save some slight photophobia.

The diagnosis of a foreign body in an eyeball must of course be rendered a difficult matter, from the great liability to be deceived by inflammatory changes occurring so soon after the injury. In the case of metallic substances perhaps the only reliable test is the metallic lustre of the body.

III. CONNECTIVE-TISSUE GROWTH IN VITREOUS HUMOR.

Louis F., æt. 42, saddler, of regular, temperate habits, and sound of body, without rheumatic or syphilitic taint.

The first sign of the disease was noticed three years ago, resembling to the patient the descent of a dark curtain from above, but only on the right eye. This soon passed away, and the sight returned to the former condition. In the following year similar symptoms presented them-



CONNECTIVE TISSUE GROWTH IN VITREOUS HUMOUR.

selves, and in both eyes, followed in a few days by a marked improvement, but not entire disappearance, as in the previous year. This unfortunately did not prove permanent, and for the last two years there had been gradual failure of sight in both eyes, with constantly recurring phosphenes. There has been no pain or marked photophobia.

Right eye Em. V. = counts fingers at 4′; visual field very defective inward and upward.

Left eye Em. V. = counts fingers at 10′; visual field particularly defective, outward also upward. The *Plate* (*vide* Fig.) represents the ophthalmoscopic appearance of the left eye-ground. The great cloudiness of vitreous humor of right eye prevented sketching its ground.

Description of Plate.

The growth, starting at the optic disk, which it surrounds, is projected upward, also downward, also inward.

The upper division starts from the papilla by three roots, which quickly unite into one stem, and run upward and outward, terminating in two branches, which fade away in the vitreous humor.

Above and inward from the termination can be seen an oblong white patch, apparently insulated, with three radiations proceeding from it; also a number of new-vessel formations starting from it and ending in spiral curves. A narrow black border surrounds this patch.

The lower division of the growth spreads out, fan-shaped, downward and outward, running along the course of the descending blood-vessels, and becoming more and more delicate and feathery until it is finally lost in the vitreous humor. A small, elongated white patch is also found in the lower outer retinal quarter.

The inner division of the growth, commencing at the papilla, rapidly widens into a broad, wide-stretching membrane, traversed by numerous blood-vessels, and projecting well forward into the vitreous humor, so much so that by an oblique illumination it is plainly visible. This formation in some places appears thick, and of opaque white color, but in other places it is delicate and attenuated.

The optic papilla is entirely surrounded by it, and from the white patch in its centre is projected a new-vessel formation; also downward and inward a similar condition is seen.

Between the different portions of the growth, also in the periphery, the eye-ground is of normal color and appearance. Retinal veins tortuous and overfilled.

The growth appears to consist of connective tissue, in some portions much thicker than in others, when it becomes almost scarcely perceptible. This, with the curious spiral-curved vessel formations, makes up a most interesting ophthalmoscopic picture.

A growth in many respects similar to this is described by Jäger in his Ophthalmoscopic Atlas, page 144.

IV. CHOLESTERINE CRYSTALS FOUND IN THE ANTERIOR CHAMBER AND ON THE ANTERIOR SURFACE OF IRIS, AS WELL AS IN THE VITREOUS HUMOR, WITH A LARGE BONE FORMATION IN AN EYEBALL ATROPHIED BY TRAUMATIC IRIDO-CYCLITIS OF SIX YEARS' STANDING.

The patient, a boy æt. 16, was six years ago struck in the left eye by an iron splinter, causing a penetrating wound of cornea, iris, and lens, and followed by irido-cyclitis, which has been slowly going on since that time.

Status præsens: Eyeball much atrophied, tension greatly lessened, and pain is caused by pressure. A large opacity exists at point of injury in the lower half of the cornea, with strong adhesion of lower half of iris to cornea, and total occlusion of pupil. Upper half of anterior chamber is of moderate depth. Sprinkled over the anterior surface of the iris and through the aqueous humor were to be seen numerous small, sparkling, irregular-shaped, amber colored crystals, having great refractive power, the effect being greatly increased by oblique illumination.

On account of sympathetic irritation existing in the second eye, the diseased eyeball was enucleated and carefully examined.

The cornea and sclerotic were found apparently normal, except at point of former corneal perforation. The anterior chamber was found to consist of a series of shallow pockets, formed by numerous adhesions between iris and cornea. These pockets were *filled* with *cholesterine crystals* and serous fluid.

The lens was shrunken to one-fourth its usual size, and closely adherent to the iris; the capsule was thickened and calcareous.

The interior of the lens was filled with cholesterine. In the vitreous humor two masses of true bone were found. The larger one—cup-shaped—spread itself around the optic nerve, and then extended towards the ciliary bodies. The second piece was ring-shaped, and situated directly under the ciliary bodies. The microscope showed the presence of lacunæ and canaliculi and other bone

deposits. Enclosed within the larger bone was found a clot of hæmatine, probably the remains of an old hemorrhage.

The space between the choroid and sclerotic was filled with cholesterine and granular pigment. With the use of polarized light the cholesterine crystals formed a beautiful microscopic object. The particular points of interest in this case may be briefly summarized as follows:

First, The immense amount of cholesterine that was found, not only in the vitreous humor, but also in the lens and the *anterior chamber, the latter being a rare seat of this deposit.*

Secondly, The large bone formation, the result of chronic choroiditis. The separate bone formation emanating from the ciliary bodies is also an interesting fact.

In looking over the literature of the reported cases where cholesterine crystals have been discovered, I find that their most frequent seat was in the vitreous humor, which was generally fluid; then in the cortical substance of the crystalline lens, also between the retina and choroid, also in the lachrymal sac.

A case reported by John Adam Schmidt (V. Ammon's Zeitschr. f. d. Ophthalmologie, Bd. I. S. 382) resembles in some respects the one reported in this article. In Schmidt's case the anterior surface of a calcareous degenerated lens was sprinkled over by a red, silver, and gold dust; also a deposit of this dust, to line depth, was found at the bottom of the anterior chamber, which, by motion of the eye, slowly swam through the anterior chamber.

In the great majority of cases these crystals are found in eyes diseased by choroidal inflammation.

SUCCESSFUL EXTRACTION OF A FOREIGN BODY FROM THE RETINA BY THE AID OF THE OPHTHALMOSCOPE. By Dr. Geo. T. Stevens, Albany, N. Y.

Mr. Matthias E. is a robust man, thirty-two years of age, employed in the office of the American Express Company. While engaged on the 6th of February, 1875, with another employé in the same office, in opening a packing-box, he holding the edge of a hatchet against the head of a nail while his companion struck the hatchet with a hammer, he felt a sudden shock, as though a piece of steel had struck the left eye. Temporary blindness succeeded the shock. In the course of half an hour, although the sight had returned, the eye was painful, having, as he expressed it, the sensation of a cinder beneath the lid. He at once consulted a surgeon, under whose charge he remained until February 22d, when the surgeon was kind enough to bring him to my office. At this examination I found the patient suffering considerable pain in the eye, to allay which he was taking morphine. The conjunctiva was injected. In the lower and outer part of the cornea, and about a line from the border, was a gray mark a line in length, and through the iris, at a point nearly corresponding to this mark in the cornea, but farther outward, was also a small opening. Examination with the ophthalmoscope showed a body having a dark gray metallic lustre, apparently lying partly on, and partly embedded in, the retina. Its position was behind the equator, and about equidistant from the horizontal and perpendicular meridians of the eye. Surrounding the foreign body was a ring of black pigment, and several patches of such pigment appeared in the vicinity. The eye was so irritable that no definite test of sight could be obtained.

The patient was at once informed of the gravity of the case, and the alternative of the loss of the eye for sight, with the probable necessity of its removal to save the other eye, or the extraction of the foreign substance was presented. He consented to the attempt for extraction, and on the following day, seventeen days after the injury, the extraction was effected in the following manner: A very careful examination with the ophthalmoscope having been made in order to determine the location of the foreign body, the patient, reclining on a couch, was brought under the influence of chloroform in a room which could be completely darkened by the closing of wooden shutters. Complete anæsthesia being produced, an incision was made

through the conjunctiva and the sub-conjunctival tissues from the border of the cornea backwards three-fourths of an inch, and between the inferior and external recti muscles, the tissues being turned away so as to expose the surface of the sclera. The shutters of the room being now closed, a "student's lamp" was held in position, and again the situation of the foreign body was exactly determined by the ophthalmoscope. At the same time a very delicate needle was carried through the sclera, the point of which, as it entered the eye, was seen by the ophthalmoscope to be exactly in contact with the anterior border of the foreign body. Daylight was now admitted, and an incision three lines in length was made through the sclera, the point of entrance of the needle marking the centre of the incision. The foreign body, which proved to be a fragment of steel, presented exactly in the middle of the wound, entangled in the retina. It was seized by a pair of fine forceps, and the small portion of the retina in which it was caught was snipped off with scissors. The distance from the centre of the pupil to the position of the foreign body was at once measured and found to be seven and a half lines. The wound was closed, and a suture brought the edges of the conjunctiva together. Cold-water applications were at once made and continued for several days. The case progressed without special incident until the eighth day, when he was well enough to be removed from the hospital to his home.

On the fifteenth day the eye was examined. There was loss of the inner part of the field of vision, but in the outer portion of the field sight was perfect.

On the seventeenth day he had a sudden sharp pain, and soon found that he could not see, except to count fingers. Ophthalmoscopic examination showed intra-ocular hemorrhage.

May 30. Eye looks perfectly well externally—no pain, but some intolerance of light—can distinguish bodies held on temporal side. The media are less opaque.

June 14. Sees more clearly. There is an appearance of dark shreds running across the vitreous; between these shreds the light penetrates. Disk cannot be seen.

June 28. Still improving. Media more clear, but disk not visible.

The Society adjourned.

July 22, 1875.

The Society met at 8 P.M. Dr. Agnew, the President, took the chair. The minutes of the morning meeting were read and approved.

CAN STAPHYLOMA POSTICUM BE INDUCED BY ASTIGMATISM? By Wm. Thomson, M.D., Phila.

Since the classic description of staphyloma by Donders, whose observations were made in cases of high myopia generally, and who regarded a staphyloma as one link in that unhappy chain of incidents beginning in fatigue and slight irritation of the conjunctiva, progressing to intra-ocular lesion, comprising floating bodies in the vitreous humor, circumscribed atrophies of the choroid, and terminating in blindness from cataract, hopeless changes at the fovea, or separation of the retina, the importance of the study of myopia has been acknowledged, and the most energetic efforts have been made to bring it under control.

Donders concluded that the crescents at the disk were induced, especially in those who have an hereditary predisposition, by prolonged convergence and accommodation in near work, which causes an inflammation of the choroid, and is attended by a stretching of the sclera, an elongation of the axis, and an increasing myopia. He remarked upon the difficulty of making observations by the erect method, and stated that in his studies the inverted method was used. His drawings show the variety of the directions of the crescentic atrophies; he has noted the straightened condition of the retinal vessels, and also the elongation of the disk at right angles to the direction of the atrophy, which he finds himself unable to account for. In low degrees of M. the crescents were narrow, but they were found larger in proportion to the higher degree of M. and the age of the patient. In two cases of H. crescents were found.

Jaeger believes that crescents are congenital, and that M. would be found in all classes, and not confined to those who use their eyes in prolonged near work. Mannhardt found M. frequent among the illiterate population of Italy. Cohn shows that its degree and its frequency increase as children are subjected to eye strain in early life, at school; and the belief that M. may be acquired and may become progressive, has led to the theory that prolonged convergence and accommodation will induce inflammation, softening, and stretching of the tunics of the ball, and that these results may be averted by the

long-continued use of atropine to overcome a supposed spasm of the ciliary muscle. This treatment has been employed by Dobrowolski, Derby, and others, whose reports are before the profession. Schnabel also reports that he has used this method, and that whilst the refraction was diminished by atropine, it was not more so than might be expected from its influence upon the accommodation in eyes of various refraction already observed by Donders. Spasm was observed in a few cases, but was neither frequent enough nor great enough to convince him that it could be an influential factor in producing high M. with great elongation of the axis. He describes two forms of staphyloma: 1. The congenital, found in eyes of all kinds of refraction, and analogous to coloboma of the choroid. 2. The acquired, due to staphyloma posticum and the displacement and atrophy of the choroid.

These conflicting theories render our views both as to hygiene and therapeutics painfully uncertain, and justify the presentation of any clinical facts that may aid us in the important duty of controlling myopia, in which these serious lesions are most frequently observed.

From my own observation I am led to believe that myopia, like hypermetropia, must be frequently congenital, and that we rarely find it without a complicating astigmatism.

When the M. is simple, the patients enjoy high V. with proper spherical glasses, suffer little or no asthenopia, and present eye-grounds free from crescents. I have before me the notes of such cases, from $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{4\frac{1}{2}}$, $\frac{1}{5}$, $\frac{1}{8}$, and upwards in degree, with perfectly normal eye-grounds. I have notes also of cases of hypermetropia from $\frac{1}{4\frac{1}{2}}$ upwards, with no lesions, high, if not full V., and absence of all fatigue when properly corrected. It is impossible to believe that a M. $\frac{1}{3}$ can have been acquired by inflammatory softening and elongation of the axis without exhibiting signs of it at the nerve entrance or elsewhere; nor can I believe that in M. of $\frac{1}{8}$, for example, there can be any injurious tension exerted upon the eye by the accommodation, since such myopes read without glasses at the *p. r.*, and have no need to use A.: furthermore, if prolonged A. could cause staphyloma posticum, we would inevitably find it in all cases of high M., where not only near, but even distant clear sight is only obtained by its vigorous use.

From the low V. obtained by spherical glasses in high M., and their failure to relieve asthenopia, I was led to seek for astigmatism, which I fancy must be frequently overlooked, from the tedious character of the examination needed for its detection, together with the

difficulty of the use of the erect method of the ophthalmoscope ; and I am satisfied that a crescent at the optic nerve is an evidence of astigmatism, and that by a study of its situation one may form a close approximation to the best and worst meridians of the cornea. In the slight degrees of astigmatism the physiological cup and the small vessels may be displaced towards the margin of the disk, where a very narrow crescent, marked by the disappearance of the hexagonal cells only, may be observed. In high degrees the optic disk is changed into an ellipse in shape, the excavation into a slit, from which the large retinal vessels emerge as if from beneath an overhanging ledge, and proceed on their courses as though pulled straight, and without any of their normal freedom ; at right angles to the long diameter of the disk will appear the brilliant white crescent, two or more times the size of the disk in extent, with its rounded arch directed upwards, downwards, or outwards, at any angle, but rarely reaching to the fovea, where, however, independent lesions are often found in old persons.

In the notes of one hundred cases of crescents, I find astigmatism combined with M. in eighty, and H. in twenty ; and in all of these after their correction under atropia, with all the most trustworthy methods of examination, the line of the crescent has been found to correspond with the astigmatic meridian of the cornea, when viewed by the erect method through the correcting glasses. In a portion of the myopic cases the axis of the cylinder has been found to coincide with the long axis of the crescent, whilst in the remainder it coincided with the long axis of the disk, and was at right angles to the direction of the crescent. In the highest defects the crescents were double at either side of disk, or circular. In all the cases of astigmatism with hypermetropia, the axis of the cylinder coincided with the direction of the displaced choroid, and the crescents were as marked as in A. with myopia ; in two cases needing + $\frac{1}{8}$cy. ax. 90° there were crescents extending downwards more than twice the diameter of the disk. In these marked instances, particularly in M., the entire disk seems dragged towards the crescent, so that it is no longer possible to see into the depths of the porus opticus, which appears overhung by the edge of the excavation ; and this sliding appears to account for the change in the shape of the disk from a circle into a narrow ellipse.

These persons all suffered from asthenopia, not relieved by any spherical correction, and many of them had used glasses of various powers for years. Regarding them as I did, I persevered through tedious hours of examination, until no better result or higher V.

could be obtained, and I have found the symptoms of irritation or inflammation removed by a proper sphero-cylindroid combination. Some of the cases have been under observation from two to five years, and have needed glasses remarkably high as $-\frac{1}{3} \supset -\frac{1}{12}$ cy., or $-\frac{1}{5} \supset -\frac{1}{6}$ cy., or $-\frac{1}{2} \supset -\frac{1}{20}$ cy., or $-\frac{1}{13} \supset -\frac{1}{12}$ cy., which the young persons use both for near and distant sight, wearing them constantly and with entire satisfaction.

In five persons the crescents were found in one eye only, the fundus of the other being entirely normal, and in these the eye with normal fundus was Em., or even highly myopic, while the one with crescents was found invariably astigmatic. How can we explain otherwise a case where the R. has M. simple of $\frac{1}{4}$, with a perfect disk, and the L. Am. corrected by $-\frac{1}{6} \supset -\frac{1}{16}$ cy. ax. 40°, and a large crescent extending down and out at right angles to the direction of the axis of cylinder? Astigmatism, and not myopia, was coincident with the staphylomata in these instances.

The exceptional cases of astigmatism, where no crescents were found, were in persons who, for various reasons, did not enjoy binocular vision; some of these having convergent or divergent strabismus, with myopic, or hypermetropic refraction, or having either one eye amblyopic, or so different in refraction from the other as to render it probable that its vision was suppressed, and not subjected to the complicated strain inseparable from the use of relative accommodation.

These clinical facts would need illustrations to render them more striking, but the appearances of the disk suggest a dragged or displaced condition of its whole structure, and hint at a force which may act injuriously upon the choroid, and thus disturb unfavorably its nutrition, and cause inflammation and consequent atrophy.

These crescents must be regarded as either congenital or acquired. If the former, they should lose all their evil portent, and afford no ground of themselves for treatment; we must then be content with the observation that they correspond to congenital asymmetries of the cornea, and that the fact pointed out in these remarks has no value beyond facilitating the correction of astigmatism. If we fear, however, that they are acquired, may increase, and be attended by other well-known misfortunes, we will spare no efforts to gain a clearer insight into their natural history, by extended clinical studies, with a view to a rational method of treatment.

In searching for the causes of these lesions, so frequently seen in high M., we must abandon the idea that in myopia there is a severe

strain on the accommodation, since we know that it must be suppressed when myopes read, as they constantly do, with moderate degree of M. at their far points, uncorrected. When M. is $\frac{1}{6}$ or more we expect to find a divergent strabismus from deficient innervation of the interni by the third pair; we know that patients can read with one highly myopic eye without inconvenience, and that it is safe and practical for persons to do likewise in artificial M., as we see in watchmakers, engravers, and others who do near work habitually for years with the accommodation entirely at rest. All our practical views of refraction demand that an eye should be considered at rest when it is adjusted for its *p. r.*, which for E. is at infinity, for M. at some finite distance away; yet we clinically find choroidal changes in M., and their absence in H., and although the accommodation is at rest in the former, and strongly excited in the latter, we are told to ascribe the lesions to prolonged convergence and accommodation in myopes. The received idea of A. is that the ciliary muscle, under the influence of the oculo-motorius, in contraction, causes a relaxation of the zonula, and that the lens, by its own elasticity, becomes more convex and possesses a higher refraction. It would thus appear that in distant vision, when the eye is adjusted for the *p. r.*, there must be a state of muscular tension sufficient to restrain this elasticity of the lens, and that we must no longer regard this adjustment as equivalent to muscular repose. These anomalies lead to further inquiry into the function of accommodation, and encourage us to throw upon the subject the light of clinical observation, remembering that in this way Graefe eliminated the influence of the iris, at one time believed to be an essential factor in A., by exerting pressure on the periphery of the lens.

The authority of the great masters, Helmholtz and Donders, sustains the prevalent theory of A., although the former, in closing his remarks upon it, states that it has the character of probability, and is in all particulars the most reasonable, and thus permits the idea that it is not yet fixed as a scientific dogma.

In regard to the anatomy of the parts concerned, Prof. Iwanof states that the choroid is firmly attached to the sclerotic at two points: anteriorly at the transition of the sclerotic into the cornea by means of the annular tendon; posteriorly, at the entrance of the optic nerve, where its inner layers are continuous with a ring which embraces the nerve, from which fine fibres are given off which penetrate the nerve itself. The ciliary muscle, imbedded in the anterior part of the choroid, consists of smooth muscular fibres, arranged in a radiating manner, and the fasciculi of which can be traced backward into the

choroid; and of fibres in a circular direction, which form the inner portion of the muscle, and are known as the annular muscle of Müller. He states that the relative development of these longitudinal and circular fibres is subject to variation, and is dependent upon the length of the optic axis; that in hypermetropic eyes the annular portion is largely developed, whilst in the myopic ones the muscle consists chiefly of radiating fibres. These facts point to the independent use of these antagonistic fibres, and hint at the existence of a negative and positive power of adjustment, the influence of which in causing structural changes in myopia may be thus studied: Suppose a M. of $\frac{1}{2}$ in each eye; without glasses the person might be able to read at 8″ with binocular vision, upon condition that a proper convergence could be maintained without using any + A.; the effort to converge by aid of the third pair of nerves would bring out + A., would increase the refraction, and compel the person to bring the book nearer; any voluntary effort that could then be made would be towards diminishing the refraction whilst preserving the convergence, the clinical result of which we daily encounter in divergent strabismus: assume that the radiating fibres, having their attachments through the choroid to the cornea and optic nerve, resemble the string of a bow, and that the circular fibres can exert a power similar to that employed in discharging an arrow, and that, through their attachments by the zonula to the lens capsule, they can both exert an antagonistic power in relaxing or rendering tense the capsule: accept Iwanoff's statement of the hypertrophy of the radiating fasciculi in M., and we can perceive how an injurious tension may be exerted upon the choroid, which, in prolonged near work, may impair its nutrition, and induce atrophy, or by pressure on the vitreous humor give rise to an elongation of the optic axis with progressive myopia. Helmholtz discussed a theory somewhat similar to this, proposed by Henke, but decided against it as unsupported then by sufficient evidence. Reasoning by analogy it would seem that the ciliary muscle, like the iris, should be provided with an independent action of its circular and radiating fibres, with a different nervous supply, and that we should not depend upon elasticity alone to enable our eyes to adjust themselves from the *p. p.* to the *p. r.*

In astigmatism I am satisfied that the eye endeavors to overcome its refractive defect by the power of A., and this can be proved by the clinical records of cases where asthenopia has rendered examinations necessary, in which V. $= \frac{20}{xx}$, but under atropine was reduced to $\frac{20}{L}$, where one meridian was E., and the other had H. $= \frac{1}{40}$, and where V.

was brought at once to $\frac{20}{xx}$ by + $\frac{1}{40}$ cy. Granting the effort an eye may make to neutralize its astigmatism, let us assume a case where each eye has an E. meridian and a *p. r.* at infinity for vertical lines, with M. $\frac{1}{12}$ for horizontal ones: place two cross lines thus arranged at 12″ from the eyes, and the horizontal one will be seen with suppressed A., but to see the vertical line at the same distance the A. must be used = $\frac{1}{12}$, and thereby the *p. r.* for the horizontal line would lie at 6″ away; combine these two eyes in binocular vision, and the law of *relative* A. would render all their muscular actions more intricate, and we would have emmetropic meridians increased by relative accommodation, and myopic ones of yet higher refraction engaged in the hopeless effort to transmit to the retina sharp images of objects which at 12″ would have their vertical and horizontal parts, for such eyes, in violent perspective; the former being seen with + A. = $\frac{1}{12}$, the latter by a vigorous effort at − A. To preserve binocular vision under these circumstances there might be, in reading, for example, a tension exerted upon the radiating fibres, which, according to Iwanof, would induce their hypertrophy and enable them to exert a strain upon the choroid which would be seen in the dragged appearances at the disk, and which might, by creating inflammation, give rise to choroiditis disseminata, etc.; finally, the line of such a displacement of the disk and choroid might well be supposed to have some connection with the unvarying astigmatic meridians of the cornea. The same reasoning will apply to hypermetropic astigmatism, since if the defective meridian is fully corrected by + A., the E meridian will need to have its refraction reduced by − A. The possibility that astigmatics, are under the necessity of making such endless fine adjustments in their near work, accounts for the severe asthenopia so often successfully removed by cylinder glasses.

Could it be shown that the radiating fibres of the ciliary muscle are, like those of the iris, under the control of the sympathetic system, the plausibility of these views would be largely increased, and the known influence of the third pair could be supposed to be confined to the circular fibres. Donders holds that atropine dilates the pupil partly by paralyzing the oculo-motorius, and partly by stimulating the sympathetic. It is known that in paralysis of the third pair the pupil, although partly dilated, becomes yet larger under atropine; we also know that while atropine dilates the pupil and paralyzes the A., its influence does not extend to the other fibres of the third pair, and ptosis and divergent squint are not observed even in poisonous doses; it would then seem that its influence upon the iris and refraction is most probably through

the sympathetic nerve. Were it possible to make accurate studies of the A. in animals the influence of the sympathetic might be set at rest, since upon its section we might expect to find, with myosis, an increase in the refraction; but we must depend as yet upon the rare cases of disease or injury of the sympathetic which present themselves clinically, and I have sought with care for this evidence in a few cases of pathological myosis dependent upon central nervous disease, but my cases were all in old men, and were complicated by atrophy of the optic nerve sufficient to render any observation as to the existence of a spasm of A. uncertain. One such case, however, has been recently reported by Dr. Reuling, of Baltimore, in a late number of *Arch. of Ophthalmology and Otology*, where myosis followed a gunshot wound of the cervical portion of the sympathetic; the pupil was small and would contract no more with calabar bean, V. $= \frac{20}{cc}$ with $- \frac{1}{18}$ V. $= \frac{20}{xx}$. A spasm of A. was proved by atropine, which dilated the pupil and reduced the refraction to $- \frac{1}{4}\frac{1}{2}$, where it remained after treatment; although from the nature of the injury there might have yet remained some paresis, yet we are here provided with a numerical estimate of the muscular tonus dependent upon integrity of the sympathetic, and of its antagonistic influence upon that power of accommodation which depends upon the third pair, and which in this case was able to induce an apparent M. of $\frac{1}{18}$.

I am not yet able to say why in myopic astigmatism the axis of the cylinder is found in one case coincident with the choroidal displacement, and in another at right angles to it. The signs of drag or displacement at the disk have a practical value in calling attention to astigmatism, and even slight defects may be thus recognized. Many of my cases have sought relief from asthenopia combined with conjunctivitis, blepharitis, etc., apparently out of proportion to the optical defects, which yielded to proper correction.

If we can assume that persons in prolonged near work, who are astigmatic, are under the necessity of making incessant use of antagonistic muscles of adjustment and convergence, we might expect serious consequences, and we would also have our attention directed towards a rational system of treatment by glasses, which, by affording mechanical aid, would supplant the therapeutic and other measures at present employed in vain in the cases of so-called progressive myopia. No expenditure of money or skill in re-arrangement of desks or school furniture can be of any service to an unsymmetrical cornea, in comparison with a glass which will harmonize its refraction and enable the eye to perform its complicated muscular functions as they are done with ease by emmetropic eyes.

Dr. Green.—We have all probably accepted as conclusive the strongly supported assertion of Donders, making myopia and staphyloma posticum almost synonymous terms (*Acc. and Refn.*, Syd. ed., p. 354). Several years ago, in reporting to this Society a series of cases of astigmatism (*Trans. Am. Oph. Soc.*, 1867–8, p. 136), and later, in commenting on an analysis of my own cases, which I had collected, with the very much larger published series of Snellen (*Trans. Am. Oph. Soc.*, 1871, pp. 105–7), I called attention to the fact that astigmatism is very often found associated with myopia, oftener, indeed, than with hypermetropia. Upon the very close relation existing between myopia and astigmatism I had insisted even somewhat earlier (*Am. Jour. Med. Sciences*, Jan., 1867, p. 118, and July, 1867, pp. 88 and 89), and had strongly advocated, in all cases of incipient or progressive myopia, the careful search for, and accurate correction of, any complicating astigmatism. At our meeting in 1871 (*Trans. Am. Oph. Soc.*, 1871, p. 107) I suggested further, in view of the very large proportion of cases of compound myopic astigmatism revealed by the analysis of the two published series, that astigmatism may probably often stand to myopia in the direct relation of cause to effect, and I ventured to assign to astigmatism a prominent place among the faulty conditions which may operate as exciting causes of myopia. Dr. Thomson's present observations, if confirmed by further investigation, would seem to show that in astigmatism the asymmetry of the refractive media is not the only important deviation from the normal condition, but that there is, in addition, a predisposition to irregular, and therefore especially dangerous, posterior distention of the globe, dependent upon asymmetry in form or development, of the eyeball as a whole. This view, of course, still further enforces the precept that even a low grade of astigmatism in the presence of a tendency to myopia is an important factor, perhaps one of the most important factors, in the case, and that to the accurate optical correction of the astigmatism, conjoined, as I think it should be in many cases, with systematic instillations of atropia, we must chiefly look for the control of the pathological process.

ON THE INCREASE OF REFRACTIVE POWER OF A PLANO-CYLINDRICAL LENS WHEN ROTATED ABOUT ITS AXIS. By Dr. G. Hay, Boston.

In the diagram Fig. 1, let P be the middle of the anterior or curved surface of the lens, and PM be a straight line in this surface (such line being parallel to the cyl. axis, and the tangent plane at this line being parallel to the plane surface of the lens). Let OP, the axis of the obliquely incident pencil, lie in a plane perpendicular to PM; this plane intersecting the curved surface of the lens in the line HP. Thus the lens may be more or less oblique to OP, but in such a way that the latter is always perpendicular to PM, which last may be called the axis of the lens.

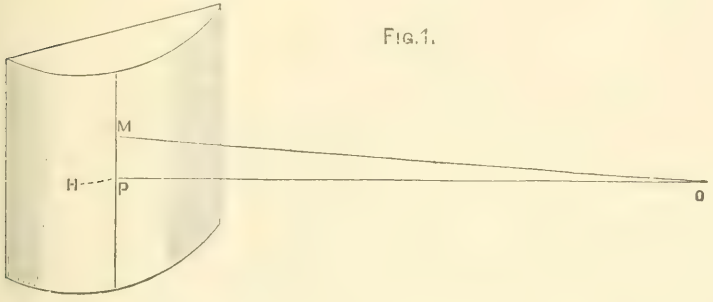


Fig. 1.

In considering the refraction of the homocentric pencil OPMH by the oblique lens we find that after refraction it becomes astigmatic.

The plane pencil OPH, in a plane perpendicular to the line around which the lens is rotated, remains after refraction in the same plane as before, and is refracted by the oblique lens in very nearly the same way as a direct pencil would be by a lens of focal distance.

$$f \times \frac{\cos.^2 \phi}{2\,(n \cos. \phi' - \cos. \phi)} \qquad [a]^*$$

* For principles according to which formula [a] may be obtained, see Parkinson's Optics, London, 1870.

f being the focal distance of the cylindrical lens,

ϕ representing its obliquity,

ϕ' the ang. of refraction corresponding to an angle of incidence ϕ,

and n being the index of refraction, equal to 1.53, about.

The values of formula [a] for f = 100, and successive values of ϕ, are given in a communication by Prof. E. C. Pickering and Dr. Chas. H. Williams, on the "Foci of Lenses placed Obliquely," published in the Proceedings of the Am. Acad. of Arts and Sciences, 1874–5, New Series, vol. ii.

Copied below is a part of Table III., on p. 304, in which the number in the second column expresses the focal distance corresponding to the obliquity indicated alongside of it in the first column.

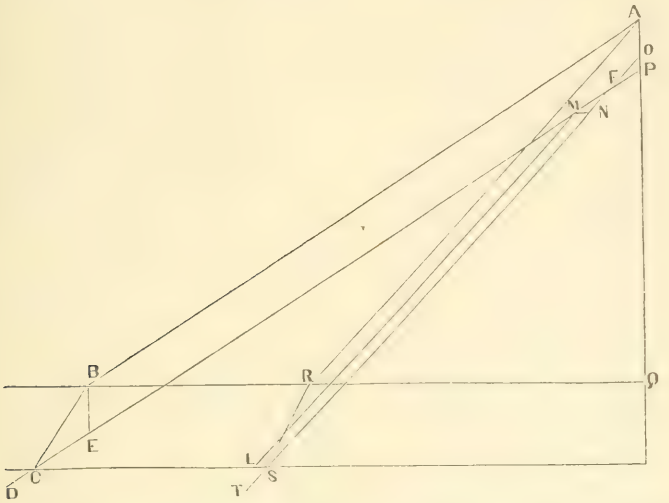
0°	100.0
5°	98.9
10°	96.1
15°	91.2
20°	84.8
25°	77.0
30°	68.4
35°	59.2
40°	49.8
45°	40.6
50°	32.0
55°	24.1
60°	17.1

The plane pencil OPM, which is at right angles to the one just considered, will be acted on by the oblique lens just as it would be by an oblique plate with plane parallel surfaces, one of them being the plane surface of the lens, and the other being the tangent plane at PM.

By referring to the diagram on p. 26 of the Society's Transactions for 1866, and reproduced here, it may be observed that the plane pencil just mentioned would have a virtual focus after refraction only a little different in position from its real origin before refraction; or, in the diagram referred to, the rays of an infinitely small plane pencil with its origin at A, its axis being AB, and its plane perpendicular to the plane of the diagram, would after refraction by the plate BCQ have approximately directions as if from point P (or really from points in the line AQ, and distant from P by infinitesimals of the second order). (See diagram on next page.)

Thus after refraction the infinitely small plane pencil OPM (Fig. 1) may be considered as emanating from a position nearly the same as its origin O before

refraction ; and moreover it will meet the plane surface of the lens in a line* nearly parallel with PM ; and therefore this refracted pencil may be regarded as being approximatively in a plane perpendicular to the plane of the pencil OPH after refraction ; their respective foci being on the straight line corresponding to the ray OP after refraction.



The whole pencil OMPH may then be considered as after refraction somewhat approximating to the conditions referred to in the first two paragraphs of p. 92, of the Society's Transactions for 1871.

Thus we see that by rotating the plano-cylindrical lens as above, while not materially altering the refractive power in the plane passing through the axis of the lens and the origin of the pencil, we increase the power in a plane at right angles to this ; that is, the oblique cylindrical lens is equivalent to a stronger cylindrical lens, nearly in position of the one before rotation, and with its cylindrical axis parallel to that of this latter. We can thus by more or less obliquity get the effect of a cylindrical lens of continuously varying power.

This increase of power may be demonstrated by the apparatus †

* The position of this line may be more accurately indicated. See Appendix to this communication.

† The instrument may be of service in some cases in selecting glasses for astigmatism. The axis of the oblique lens is fixed perpendicular to the axis of a straight tube, one and a half inches in calibre ; the tube rests on a firm support, and may be rotated about its own axis ; so that we can bring the axis of the cylindrical lens into any desired position, and then vary the power

shown in which a lens + $\frac{1}{7}\frac{1}{0}$c. by successively increasing obliquity, neutralizes stronger and stronger concave cylinders, till at an obliquity of 60°, it neutralizes — $\frac{1}{1}\frac{1}{2}$c.; the glass to be neutralized being placed about an inch from the middle of the oblique cylinder, between the latter and the test-object, letters No. XII. distant 13 feet.

The following is a table of successive concave cylinders neutralized by rotating + $\frac{1}{7}\frac{1}{0}$c. in the circumstances just mentioned.

Obliquity observed, in degrees.	Neutralizes glass.	Obliquity observed, in degrees.	Neutralizes glass.
21 32½	— 60	52 53+ 55	— 18
27 30 35	— 48	54 55 57	— 16
37½ 39	— 42	56 58	— 15
42 43	— 36	56 58 59	— 14
47 48 49	— 30	58 59 61	— 13
48 50	— 24	60 61	— 12
50 + 52 — 52½	— 20		

APPENDIX TO THE PRECEDING COMMUNICATION.

ON THE REFRACTION BY A GLASS PLATE OF AN OBLIQUELY INCIDENT PLANE PENCIL WHOSE AXIS IS PERPENDICULAR TO THE INTERSECTION OF THE PLANE PENCIL WITH THE FIRST SURFACE OF THE PLATE.

Consider (see Fig. 2) a plane pencil ARB′ incident obliquely upon a glass plate, and such that the axis AR of the pencil is perpen-

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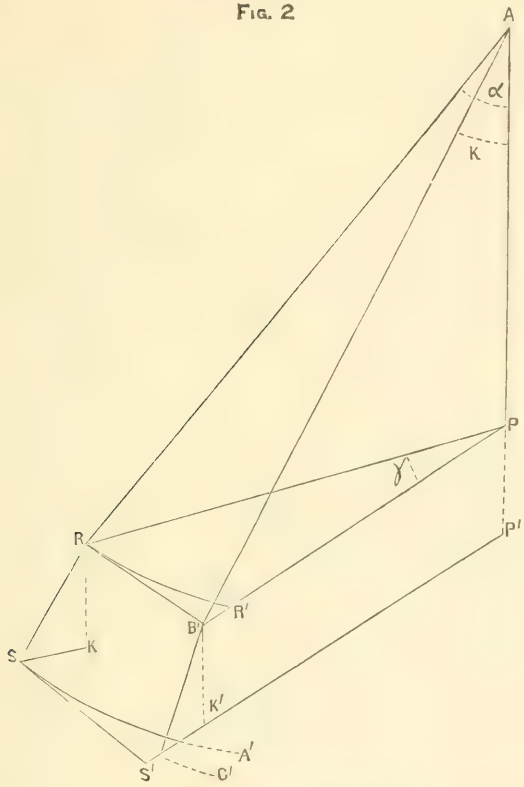
of the lens by altering its obliquity. An inch from the oblique lens, between it and the test-letters, is a place for another glass, spherical, or, if desired, cylindrical.

dicular to the intersection RB′ of the pencil with the anterior surface of the plate.

FIG. 2



RPB′SP S′ represents a plate of glass with plane parallel surfaces.
APP is perpendicular to the plate.
A is the origin of the plane pencil of light considered.
α = angle RAP.
κ = " B′ AP.
β = " S RK.
γ = " RPB′ = SP′S′.
κ' = " C′B′K′.
RR′ is circular arc in first surface, about P, with radius RP.
RB′ is tangent to RR′ at R.
SA′ is circular arc in second surface, about P′, with radius P′S.
SS′ is tangent to SA′ at S.
ARS is the course of ray AR.
RK is perpendicular to surfaces of the plate.
B K′ is perpendicular to surfaces of the plate.

It is proposed to find where this pencil, when refracted, intersects the second surface of the plate.

Take $AP = p$

$PP' = t$

we have $SP' = SK + RP = p \text{ tang. } \alpha + t \text{ tang. } \beta$

$S'P' = SP' \text{ sec. } \gamma = p \text{ tang. } \alpha \text{ sec. } \gamma + t \text{ tang. } \beta \text{ sec. } \gamma$ [1]

$C'P' = B'P + C'K' = p \text{ tang. } \kappa + t \text{ tang. } \kappa'$

$= p \text{ tang. } \alpha \text{ sec. } \gamma + t \text{ tang. } \kappa'$ [2]

since $\text{tang. } \kappa = \text{tang. } \alpha \text{ sec. } \gamma$ [3]

Rays from A to arc RR′ will, after refraction, meet the second surface in arc SA′. But rays from A to RB′ will meet the second surface between the arc SA′ and its tangent SS′. To show this, consider the course of the ray AB′C′.

We have above the equations [1] and [2]. We shall show * that

$$\text{tang. } \kappa' < \text{tang. } \beta \text{ sec. } \gamma, \qquad [4]$$

whence it follows that

$$C'P' < S'P'$$

but

$$C'P' > P'A'$$

Since ray AR′ would meet the second surface at A′.

∴ C′ would lie between A′ and S′.

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* To prove that

$$\text{tang. } \kappa' < \text{tang. } \beta \text{ sec. } \gamma \qquad [4]$$

we have

$$\text{sin. } \kappa' = \frac{\text{sin. } \kappa}{\mu}$$

$$\text{tang. } \kappa' = \frac{\text{sin. } \kappa'}{\text{cos. } \kappa'} = \frac{\text{sin. } \kappa}{\sqrt{\mu^2 - \text{sin.}^2 \kappa}}$$

similarly,

$$\text{tang. } \beta = \frac{\text{sin. } \alpha}{\sqrt{\mu^2 - \text{sin.}^2 \alpha}}$$

and then

$$\frac{\text{tang. } \kappa'}{\text{tang. } \beta} = \frac{\text{sin. } \kappa}{\text{sin. } \alpha} \sqrt{\frac{\mu^2 - \text{sin.}^2 \alpha}{\mu^2 - \text{sin.}^2 \kappa}} \qquad [5]$$

The second member of [5] becomes by [3] equal to sec. γ, if instead of μ we put 1.

We also have

$$\frac{\mu^2 - \text{sin.}^2 \alpha}{\mu^2 - \text{sin.}^2 \kappa} < \frac{1 - \text{sin.}^2 \alpha}{1 - \text{sin.}^2 \kappa}, \quad \text{since } \kappa > \alpha$$

$$\therefore \frac{\text{tang. } \kappa'}{\text{tang. } \beta} < \text{sec. } \gamma.$$

SOME PECULIAR PHENOMENA ATTENDING A CASE OF SUDDEN TEMPORARY LOSS OF HEARING AND SIGHT. By Henry W. Williams, M.D.

May 13th, 1875, I saw a little girl of eight years, who six weeks before had suddenly become totally deaf. Four weeks later sight was also for a time completely lost, and the child, who had until now been able to understand what was said to her by watching the movements of the lips, could not be communicated with. This complete blindness seemed to continue during most of one day. After this, and until and at the time I saw her, these singular phenomena were observed: At intervals of a day or two absolute blindness for one or two hours, but during the intervening periods, although there was constant nystagmus when the eyes were left to themselves, and although the attention of the eyes was not arrested by a reflection of light into them from a gold watch or other bright object, yet if a person was so placed that the child's eyes were directed towards those of the other, her eyes instantly became fixed, she smiled, and seemed greatly delighted at perceiving something. Fixation continued as long as the observer's eyes were kept open; but the moment these were closed, the child's eyes began again to wander as if in search of the lost object, and continued to do so till the observer's face was placed so as to bring the eyes into the child's axis of vision, when the same look of delight, with fixation, was repeated. It made no difference whether the parents or any other person tried this experiment.

There being no history of severe cerebral symptoms, which must have existed if any intracranial lesion had occurred of such extent as to affect both the organs of hearing and of sight, Dr. J. Orne Green, who examined her ears without finding any abnormal change, and I, who had obtained no other than normal appearances on ophthalmoscopic examination, arrived independently at the conclusion that the cause of the symptoms was probably due to reflex irritation of the nervous system, arising from the presence of worms in the intestines.

On questioning the mother, she stated that a piece of flat, white worm, about an inch in length, had been observed in the stools.

Our advice was, that the parents should take the child home and submit to renewed treatment for the expulsion of tenia, which had

already been attempted by the family physician; and we had the satisfaction of learning, within a few days, that the expulsion of a large amount of tape-worm had been followed by a recovery of hearing and sight.

NOTE.—This case derives additional interest from the subjoined note by Dr. Green:

The child had always been considered healthy. Six weeks before I saw her, being then in apparently perfect health, she called her parents' attention to the fact that she did not hear well in the right ear; no pain or noises were complained of, and but little was thought of her remark. She slept well that night, but the next morning was totally deaf in both ears; there was no pain, headache, vertigo, staggering gait, noises, or other symptom. She ate, played, and slept well, but the deafness remained total, so that the parents were unable to find any sound which she could hear; there were no marked nervous symptoms.

Her mother had noticed that she had had an insatiable appetite, and once thought she had seen in the discharges something like tape-worm, for which pumpkin-seed and turpentine were administered without avail.

At my examination I found the pulse 96, full and regular; respiration normal; tongue clean; the ears were in appearance perfectly normal.

It was impossible to say whether she heard the tuning-fork on the head; a sharp whistle, blow, or shouting she certainly could not hear.

A note from her father, after their return home, informed me that after the administration of kousoo and pumpkin-seed, she passed white, thread-like pieces from the bowels, which were thought to be macerated tape-worm, and that the next morning on waking she exclaimed, "I see, I see, and I can hear too!" Both sight and hearing remained for a week, when the sight and then the hearing were again lost, but returned in a few days as before, and continued to alternate, sometimes both of the senses being perfect, and sometimes wholly lost. During one of the attacks the memory also was wholly lost for one day.

The intervals of good sight and hearing were increasing in length, and as the child was somewhat reduced in strength, further medication was stopped for a time, and since then I have heard nothing more from her.

TWO CASES OF VASCULAR DISEASE OF THE ORBIT.

Dr. Geo. C. Harlan, Phila.

Neither of the cases that I am about to report to the Society are new, but they are not on that account entirely without interest, as marked changes have taken place in each since they appeared in public before. They were under my care at the same time about six years ago. One of them I reported in the *Am. Jour. of Medical Sciences* for July, 1870, and a brief account of the other was given by Dr. Newton, in a paper on orbital aneurism in the same journal.

Case I.—Aneurism by anastomosis in the orbit. L. L., æt. 25. General health good. So long as he can remember the left eye has been prominent, and the left side of the head larger than the right. He can remember noticing, in his early childhood, a rushing sound in his head and eye. The following was his condition when first seen, six years ago: The deformity is very striking, as, besides the protrusion and distortion of the eye, the whole of the left side of the face is enormously hypertrophied. There is no œdema of the thickened soft parts; they are dense and firm. The beard is coarse, and grows much more rapidly on this than on the other side. The hypertrophy subsides gradually towards the upper part of the forehead, and does not extend to the scalp.

The external meatus of the left ear is nearly closed by the encroachment upon it of the anterior wall. The soft parts are so much thickened that it is almost impossible to determine if the bones are enlarged or not. The mucous membrane of the left side of the mouth is thickened, and the left side of the tongue is twice as large as the right, presenting, with its coarse papillæ, a marked contrast. His appearance is very suggestive of facial paralysis, and the tongue, when protruded, is directed towards the right side, but there is an entire absence of any kind of paralysis.

The left eye is enormously protruded, and is fixed in its distorted position downwards and outwards, the upper border of the cornea being a quarter of an inch below the lower border of the other cornea. He can count fingers with that eye, but has no useful vision. The lids are distended, and still cover the eye. Immediately above the

eyeball, and lying more towards the inner side, there is a distinct tumor of almost cartilaginous density; it is flattened from above downwards, and its narrow edge projects beyond the orbit. In this tumor, and the ball with it, there is a pulsation strong enough to communicate an evident motion to the head of the auscultator. There is a loud aneurismal bruit, which is not only a source of annoyance to the patient himself, but can be heard by others at some distance from his head. There is a doughy swelling of the soft parts, extending about an inch above the orbit, in which strong pulsation can be felt. Pressure on the left carotid stops all pulsation, and the tumor becomes soft and compressible, and can be pushed back into the orbit. A vascular tumor, formed by engorgement and hypertrophy of the inferior palpebral fold of the conjunctiva, almost conceals the cornea, and not only greatly increases the deformity, but occasions a good deal of pain, being constantly irritated and inflamed from exposure. It has also bled quite freely several times, and was the immediate cause that brought the patient to the hospital. This conjunctival tumor was removed in several operations by means of constriction with silk ligatures, and the patient, not caring to undergo further treatment, left the hospital.

Dec., 1874. He called on me again, on account of trouble in the right eye. He states that about a year ago the sound in the left eye commenced to diminish, and is now very rarely heard. Last spring the bulging of the left eye increased, and about the same time he noticed an enlargement of the vessels on the forehead. Two or three months ago his attention was called to the bulging forward of the right eye, and lately his vision has failed.

There has been very little change in the appearance of the left eye; it is, perhaps, a little more protruded. The aneurismal bruit has decidedly diminished, and is now heard only directly over the tumor. The sound cannot be heard on auscultation of the temple, nor is it heard by the patient himself. The ophthalmoscope shows the media clear, the disc atrophied, the retinal arteries contracted, and the veins enormously contorted and engorged. It also shows an hypermetropic refraction of $\frac{1}{8}$, which, supposing the eye to have been originally emmetropic like the other, proves that its antero-posterior diameter has been shortened by the pressure to the extent of one millimetre and a quarter. The supra-orbital and frontal arteries are much enlarged, and can be plainly seen to pulsate. None of the other vessels on that side seem affected, but the varicose condition extends down the angular branch of the facial on the right side. Aneurismal fremitus

can be distinctly felt in this artery for an inch or more below the internal angle of the eye. The pulsation in all these vessels is immediately stopped by pressure on the left carotid. The vessels on the right side of the forehead are not affected.

There is a very evident exophthalmus of the right eye, but no pulsation. It can easily be pressed back into its normal position, but instantly bulges forward again when the pressure is removed. The larger conjunctival veins are in a varicose condition, forming quite broad red lines radiating from the edge of the cornea. V. = $\frac{20}{40}$. Refraction = Em. Disk slightly hyperæmic, but not at all swollen. Retinal veins engorged.

He was ordered a sedative and astringent wash for the right eye, and atropia was used to diminish the irritation of the left. Has general directions about his mode of life, etc., and to keep the left eye more completely protected.

May, 1875. Much improved. V. O. D. $\frac{20}{XX(?)}$, but complains of night blindness. Cannot trust himself in the street alone after dusk. Protrusion O. D. rather less. varicose condition of vessels of forehead diminished, and thrill in angular artery of right side hardly perceptible.

Ophthalmoscope shows in O. D. rather less engorgement of retinal veins, but margin of disk hazy and indistinct, and contour of vessels in its neighborhood not clear—indicating œdema.

I think that there can be little doubt of the character of the affection in this case. Its congenital origin, the hypertrophy of the whole side of the face, the involvement of some of the external vessels, and the evident extension of the disease beyond the orbit to the subcutaneous tissue of the brow, point definitely to aneurism by anastomosis. The disease is not confined even to the internal carotid and its branches, as is shown by the excessive nutrition of parts that receive their blood from the external carotid. I have not been able to satisfy myself whether the protrusion of the other eye, recently noticed, is the result of venous obstruction from the extension of the disease behind the orbit, or whether the disease is creeping over into the right orbit from in front, by means of the free anastomosis at the root of the nose. On either supposition it is difficult to account for the only serious symptom remaining, which is, unfortunately, very marked, of night blindness.

The question of treatment has given me a good deal of anxiety. Not much is to be expected from compression, though I have made a not very successful attempt to teach the patient to control the

artery himself. The disease seems to be too extensive, and not sufficiently defined to be treated by injection, which at best is an uncertain and dangerous remedy. There remains the question of ligature of the carotid, which some of my surgical friends have strongly urged, but I hesitate to insist upon it, because of the danger it involves, and of the fact that the patient is able to attend to work and support his family, and, above all, because the records of surgery show that the treatment of aneurism by anastomosis, and cirsoid aneurism by distal ligature, has been extremely discouraging in other localities, and, at the same time, furnish good reason for suspecting that its reputed exceptional success in the same form of disease in the orbit has been founded in mistakes in diagnosis.

Case II.—Pulsating exophthalmus following injury.

The following history of this case is taken from the *Am. Journal of Med. Sciences* for July, 1870. S. G., æt. 25—a robust man—brakesman on the Penn. R. R., was admitted to Wills' Ophthalmic Hospital, August 14th, 1869. On the 20th of June, 1868, while standing on the platform of a car in motion, he received a violent blow upon the head from another car, moving in the opposite direction, on a side track, which fractured the lower maxilla on both sides, and inflicted several scalp wounds. He stated that he was partially insensible for three weeks, and that when he returned to consciousness his right eye was very prominent, and that he "heard a roaring sound, like falling water, in his eye," with every stroke of the pulse, which he had never been free from since. A "red tumor," which had appeared on the right eye, partly covering the pupil and interfering with vision, had been cut out by his medical attendant. A cicatrix in the conjunctiva, at the inferior palpebral fold, proved the tumor to have been a chemosis.

The left eye commenced to protrude in about two months.

At the time of his admission, fourteen months after the injury, there was great exophthalmus of both eyes, greater of the left, which seemed almost dislocated, the equator of the ball being in front of the edge of the orbit. The left ball could be pressed back into its proper position and easily held there, without pain to the patient, but immediately bulged forward again when the pressure was removed. The right eye resisted pressure, its position could not be altered, and strong pressure gave pain. He had excellent binocular vision; accommodation = $\frac{1}{5}$; pupils freely movable, and ophthalmoscopic appearances normal.

In addition to the "sound in the eye" referred to, he felt every

arterial pulsation "like a little jerk all over his head," and coincidentally there was a slight apparent motion of any object that he looked at steadily; on auscultation a loud aneurismal murmur could be heard over any part of the head or face, most distinctly over the right temple. This murmur, as well as the pulsation, was entirely stopped by pressure on the right carotid. There was never any pulsation of the left ball. During the pressure on the artery the right ball could be replaced. No effect was produced upon either eye by pressure on the left carotid, or upon the left eye by pressure on either artery.

Complete digital pressure of the right carotid was kept up continuously from three P.M. until eleven P.M.—a period of eight hours—the pulse ranging in the meantime, under the influence of veratrum, from 44 to 56. The murmur, though still quite distinct, was now much less loud, and altered in character. The patient stated that the "roaring was fainter and had a shriller sound" after this intermittent pressure was applied from four to six hours daily, principally by the patient himself, who learned to control the artery better than any one else; he accomplished it sometimes by the thumb, sometimes by a tourniquet I had made for the purpose, and sometimes by means of a contrivance of his own, consisting of a stick about a foot long, with the end properly shaped and padded, which he pressed against the artery and held in his hands or rested on a table. The diminution of the sound continued, and the exophthalmus was decidedly lessened, particularly of the left eye, making an evident change for the better in the patient's appearance.

This treatment was continued for five weeks, during the last two of which no progress was made. Continuous pressure was then again tried, being kept up by relays of students for twenty-four hours, but with scarcely any effect. The patient then left the hospital, expressing himself satisfied that the improvement attained fully compensated him for all he had endured. Eight or nine months afterwards he wrote me that he had resumed his occupation of brakesman, and that the former condition of his eyes had returned; that he was no better than when he entered the hospital.

November 17th, 1870. About six months later he wrote again that he had been keeping up intermittent compression, at frequent intervals each day, and was improving. Two years after this time, November 9th, 1872, his brother called at my office to say that the prominence of both eyes had entirely disappeared. There was still some sound, and he continued to practise occasional compression for

several months longer (more than three years after the commencement of treatment), when all symptoms had disappeared.

Of course there is a possibility that this may have been a case of spontaneous cure. I find three cases reported, two by Erichsen (*Science and Art of Surgery*, Am. Ed., vol. ii. p. 108), and one by Dr. E. L. Holmes, of Chicago (*Am. Jour. Med. Sciences*, July, 1864), in which all the symptoms of orbital aneurism disappeared under medical treatment, without either ligation or pressure. They were all of traumatic origin. The duration of the disease was, in one case, one year, in another eighteen months, and in the third, three years and a half. There is, however, sufficient ground for connecting the compression with the result, to justify us in giving this kind of treatment a more prolonged trial than has usually been done. The following extract from the patient's letter will show the immediate effect of each compression:

"I kept up the compression on the artery until about two years ago, when a perfect cure was effected. I could have been relieved of the task of compressing the artery sooner, if I had confined myself more closely to it, but as long as it did not give pain I seldom compressed it; but as soon as it would pain I would put my thumb on the artery, often without noticing what I was doing, as I got so accustomed to it that it was no task. After removing my thumb from the artery, it would be but an hour or two until I would have a slight pain. So the compression was kept up several hours a day."

Compression of the carotid has been tried in a number of cases, but only two instances of success are recorded, those of Gioppi and Scarramuzza (Hart, *Lancet*, March 15, 1862). In the case reported by Freeman, of Canada, the pressure was made not on the artery, but directly over the tumor (*Am. Jour. Med. Sciences*, No. 103, p. 277).

Gioppi made intermittent digital compression, suspended every few minutes, for a few hours, during four days. In the other case the cure was effected by intermittent compression, occupying seven hours and twenty minutes, in the course of eighteen days.

Galvano-puncture failed in the hands of Bourguet and Pètuqin, though ligature of the carotid proved equally unsuccessful in the latter case; six cases of cure by injections have been reported (Noyes, *N. Y. Med. Jour.*, vol. viii. p. 666), and the brilliant success of ligation of the carotid is well known.

When the case of S. G. was reported before, I had not the slightest hesitation in calling it an "orbital aneurism," but the more I have looked into the subject the less confident I have been of my opinion,

and in view of the admitted difficulties of diagnosis, and the many recorded mistakes of the high authorities, I have thought it safer to retire behind the comprehensive term of "pulsating exophthalmus."

Following the view maintained by Travers in his report of the first case in 1809 (*Med. Chirurg. Trans.*, vol. ii. p. 1), no one, for thirty years, seems to have had a doubt that these cases of so-called aneurism of the orbit were all of the anastomotic variety. Then Busk's paper (Id., vol. xxii. p. 124) threw a doubt on this, and it was pretty generally held that they were of the ordinary spontaneous or traumatic kinds, until Nunnely, in 1864, maintained that "in the great majority of such cases of protrusion of the eyeball there is no disease whatever in the orbit, but that the symptoms depend on obstruction to the return of blood through the ophthalmic vein."

There is good ground for believing that this view is correct, and that orbital aneurism is, to say the least, an extremely rare disease.

In the decision of questions of pathology, the post-mortem room may be considered the supreme court, and, with the exception of the complicated case briefly recorded by Guthrie (*Operative Surgery of the Eye*), who attributed the protrusion of the ball as much to an extensive hypertrophy of the recti muscles as to the aneurism, we are still, so far as I can learn, without positive proof that such a thing as an aneurism in the orbit has ever existed.

The following post-mortem records, which are all that I have been able to find, speak for themselves, and it may be taken for granted that a post-mortem examination that proves a mistake is, at least, not more likely to be published than one that confirms the previous diagnosis.

I. Reported by Nunnely (*Med. Chirurg. Trans.*, 1864). Diagnosis, orbital aneurism. Origin, spontaneous. Ligature of carotid. Post-mortem, ophthalmic artery "considerably enlarged," but principal disease in the carotid, which was decidedly dilated as it emerged from the bony canal.

II. Nunnely (Ibid.). Diagnosis, orbital aneurism. Spontaneous. Ligature of carotid. P. M., eighteen months afterwards, pressure on cavernous sinus and ophthalmic vein by a malignant growth.

III. Nunnely (Ibid.). Diagnosis, orbital aneurism. Spontaneous. Ligature of carotid. P. M., four and a half years after, circumscribed aneurism of ophthalmic artery, just at its origin on the right side of the sella turcica, as large as a hazel nut; arteries of the orbit of very small size.

IV. Bowman (*R. L. O. H. R.*, ii., p. 6). Diagnosis, orbital

aneurism. Traumatic. Ligature of carotid. Death from hemorrhage. P. M., cavernous sinus and ophthalmic vein, at its origin, obstructed by clot from phlebitis. Mr. Bowman states positively that "all the physical signs of orbital aneurism were present in a marked degree" in this case.

V. Nélaton. Traumatic. Diagnosis, according to Dr. E. L. Holmes (*Am. Jour. Med. Sciences*, July, 1864), who saw the case at Nélaton's clinique, "aneurism of ophthalmic artery;" according to Dr. Delens, of Paris (quoted by T. Holmes, *Lancet*, Aug. 2d, 1873), wound of internal carotid. No operation. P. M., aneurismal varix from direct wound of carotid and cavernous sinus.

VI. Nélaton (Holmes, *Lancet*, Aug. 2d, 1873). Traumatic. Exophthalmus, pulsation, bruit. Small, rounded, movable pulsating tumor at upper and inner part of orbit. Intense chemosis. Diagnosis, aneurismal varix between carotid and cavernous sinus. Ligature of carotid. P. M., wound of carotid and cavernous sinus by spicula of bone from fracture of base of skull.

VII. Baron (Ibid.). Exophthalmus and intense bellows murmur over the eyeball. Spontaneous. P. M., aneurism of carotid in cavernous sinus.

VIII. Gendrin (Wecker, *Mal. des Yeux*, vol. ii. p. 806). Diagnosis, orbital aneurism. Spontaneous. No operation. P. M., obstruction of cavernous sinus and ophthalmic vein by clots. Arteries also diseased, but nothing like an aneurism.

IX. Aubrey (Ibid.). Diagnosis, aneurism of ophthalmic artery within the orbit. Spontaneous. No operation. P. M., great dilatation of cavernous sinus and ophthalmic vein.

X. Lenoir (Ibid.). Diagnosis, aneurismal tumor within the orbit. Supposed to be traumatic. Ligature of carotid. Death nine months after. P. M., encephaloid tumor of the orbit.

XI. Hamilton (Noyes, *N. Y. Med. Jour.*, vol. viii. p. 666). Diagnosis, not given. Spontaneous. Ligature of carotid. P. M., malignant growth in orbit.

XII. Richet (*Oph. Congress*, 1868). Diagnosis, pulsating tumor of the orbit. Exophthalmus, pulsation, loud bruit. Spontaneous. Ligature of carotid. P. M., dilatation of ophthalmic vein from phlebitis. No affection of any artery.

XIII. Eltingen (*Klin. Monatsbl.*, Feb., März, 74, p. 58). Diagnosis, suspicion of aneurism, but probably venous thrombosis. Exophthalmus, pulsation, bruit. Spontaneous. No operation. P. M., two years afterwards, partial obliteration of orbital veins, but no change in the arteries.

XIV. Morton (unpublished). Diagnosis, post-orbital aneurism of ophthalmic artery or carotid. Exophthalmus and bruit, but no pulsation. Spontaneous. Ligature of carotid. P. M., venous obstruction from clot, but nothing like an aneurism.

An analysis of these fourteen cases gives:

Venous clot from phlebitis, 4 cases.

Venous dilatation from phlebitis, 2 cases.

Malignant growths, 3 cases.

Post-orbital aneurism, 3 cases.

Post-orbital varix, 2 cases.

Competent observers had committed themselves to the diagnosis of orbital aneurism in nearly all these cases, and in the remainder the same conclusion could hardly have been resisted by any surgeon whose attention had not been particularly called to the subject. In only five cases was there anything like an aneurism, and in them the arterial lesion was so situated that it could be the cause of the orbital symptoms only in the same manner as any other obstruction to the venous flow might be.

Since the above was written, I find in *The Lancet* (April 3d, 1875) a condensed report of a paper on pulsating tumor of the orbit, read by Mr. Walter Rivington before the Royal Med. Chirurg. Society, whose Transactions contain so large a proportion of the literature of this subject. Twelve cases in which examination was made after death are referred to, but as the paper is not yet published, I have no means of knowing how many of his cases are not included in the list that I have given. A very interesting discussion followed the reading of the paper, during which Sir James Paget made the following remarks upon the cause of the pulsation in these tumors: "The conditions of pulsation of other tumors situated in bony cavities might throw some light on the mode of its occurrence. Any swelling lying in a bony cavity, even when there is no large cavity behind it, will pulsate. Thus, in a recent case of tumor of the antrum, in which there were no large vessels, there was distinct pulsation. Mr. Stanly has also collected and published cases of similar pulsating tumors of bone. A tumor of any sort in a cavity may receive a communicated pulsation from vessels of small size in the walls of the cavity. Another similar condition often seen is that of a cavity in a necrosed bone filled with pus, in which the fluid resting there shows a distinct pulsation visible to the eye. Such a hollow bone, with blood-vessels in its walls, is precisely similar to a bony cavity, such as the orbit, which, to complete the analogy, is full

of fat, which is really fluid at the ordinary temperature of the body."

The same thing is well illustrated by the pulsation at the bottom of the external auditory meatus, which forms a familiar symptom of perforation of the membrana tympani. The pulsation and exophthalmus are natural enough results of venous obstruction, but the cause of the aneurismal bruit, which has been so often noticed without arterial disease, is not so plain. It is probably the result of constriction of the carotid artery by pressure.

After all that has been said and written about orbital aneurism in the last seventy years, we cannot yet avoid the conclusion that we have no means of detecting it with any degree of certainty. In the words of Mr. T. Holmes, "At present all we can say is, that the symptoms of orbital aneurism are, in some cases, exactly imitated by cases in which only the venous system is affected." One point that may be considered pretty well established is, that there is scope for much deliberation and some modesty in the matter of diagnosis.

The Society adjourned to meet Friday morning at 9.30.

July 23, 1875.

The Society met at 9.30 A.M. The President, Dr. Agnew, in the Chair. The minutes of the last meeting were read and accepted.

Dr. Prout made the following motion, which was adopted:

"It is recommended that the printed Reports of Special Public Institutions for the Treatment of Diseases of the Eye and Ear, with which members of this Society are connected, be sent by them to all their fellow-members."

In behalf of the Committee appointed for the purpose of selecting a subject for discussion for the next annual meeting, Dr. Kipp recommended the following: The Nature and Treatment of Tumors of the Optic Nerve.

CASE OF SECTOR-LIKE DEFECT OF FIELD OF VISION.

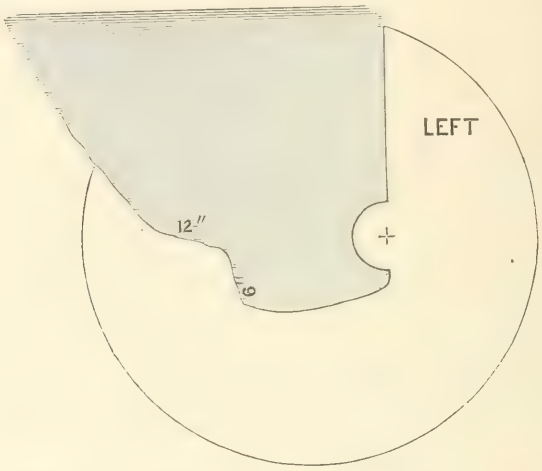
By Wm. Thomson, M.D., Philadelphia.

In the Proceedings of the Society for 1871, I reported a case of complete hemiopia, the result of a severe gun-shot wound of the left parietal region, in which the line of blindness diverged to some extent at the point of fixation towards the blind side of the field. A similar case has now presented itself, and will be briefly detailed.

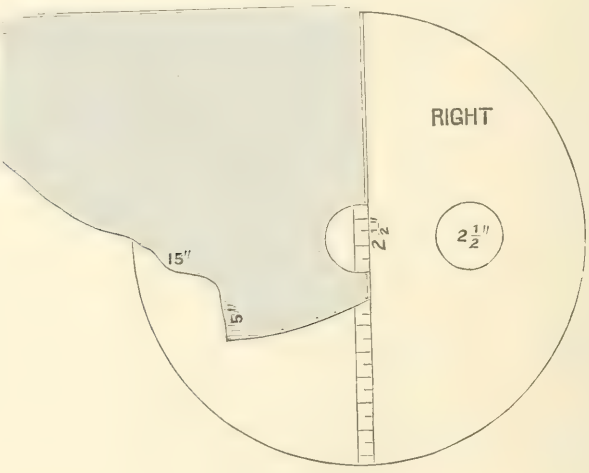
S. L., aged 50, a carpenter, and in good health at present. Four years ago was overcome by a sudden vertigo, was insensible for a few moments, his hands were numb for several days. His sight was disturbed then, and has so remained without change until the present date. The eyes present no sign of disease on inspection. V. in each is $\frac{1}{1}$.

There is no evidence of glaucoma. Each fundus is free from change; in each nerve there is a large physiological excavation, perhaps a little too white. There is no lesion or change in vision beyond a partial loss of field in the upper and left quadrant. The insensitive portion of the retina was easily recognized on placing the patient at some distance from a light, and throwing its image on various parts of the retina, and learning from the patient where the light was seen or lost to view. The field was further examined by the blackboard and piece of chalk, the man being placed sixteen inches from it; Mariotte's spot in the R. was found to be about $2\frac{1}{2}$ inches in diameter, but in the L. it could not, of course, be determined, since it was situated in the lost portion of the field. From the sketch of each field it will be seen that the line of blindness is vertical above the point of fixation, but that it diverges towards the blind side a short distance above it, describes a half circle, and returns to the vertical line below, from which it descends towards the left for fifteen inches, then rises to the horizontal line, and thence passes upwards, and to the left to the periphery of the field. In the case published in 1871, it seemed that at the region of the fovea, the elements from each side of the brain might be intermingled, and that thus the full V. might be accounted for in cases where severe lesions were known to have occurred in one hemisphere. An effort was made to test this idea in this case where the loss of a quadrant of each field was only felt as

an inconvenience, and where there was the full acuity of vision at the point of fixation, and at the same time, to measure the dimensions



of the space where sharp sight yet remained. The man was a carpenter, accustomed to make careful observations, and I chose a tool with which he was familiar. An ordinary rule, with the foot-scale



clearly marked on it, was placed vertically on the blackboard, with its upper half in the lost part in the field; it was then pushed slowly

towards the perfect part of the field until its right edge was just visible, the remainder being in the blind part. The man then himself remarked, that at or near the point of fixation, the entire width of the rule was clearly seen; and this portion was found to measure from above downwards 2½ inches.

From the history of the case there is little doubt that four years ago there was an apoplectic attack which induced the partial hemiopia, and that it was caused by a lesion of the left side of the brain. All traces of paralysis had long since disappeared, and there had been no change since the first day in the condition of the eyes. The man was intelligent and a good observer, and great care was taken to verify the fact that at the fovea the blindness was not vertical, as it was both above and below. An autopsy is yet required to give the case value.

Dr. Roosa offered the following resolution, which was carried:

Resolved, That it is the sense of this meeting, that the session of the Society for 1877 should be held at Put-In Bay.

Dr. E. Williams offered this resolution:

Resolved, That the sense of this Society is in favor of New York as the place for the meeting of the next International Ophthalmological Congress. This was carried.

Dr. Roosa moved that the Report of the Committee be accepted, and that the officers therein named be re-elected.

For *President*.—Dr. C. R. Agnew, New York.
" *Vice-President*.—Dr. G. Hay, Boston.
" *Recording Secretary and Treasurer*.—Dr. Richard H. Derby, New York
" *Corresponding Secretary*.—Dr. H. Althof, New York.
" *Publishing Committee*.—Dr. H. D. Noyes, and Dr. E. G. Loring, New York.

The Committee's Report was accepted, and the above officers were unanimously re-elected.

The following notice was presented by Drs. Dix and Williams, of Boston.

OBITUARY NOTICE.

Dr. Edward Delafield, the first President of the American Ophthalmological Society, died at his residence, in New York, on

Saturday, the 13th of February, 1875, in the eighty-first year of his age.

Dr. Delafield was the son of John Delafield, who held for many years a high position in the mercantile community.

He graduated at Yale College in 1812, and at the College of Physicians and Surgeons in 1815.

After serving in the New York Hospital he pursued his studies abroad, chiefly in London, as a pupil of Astley Cooper and Abernethy. On returning to his native country, he established, in 1820, in connection with the late Dr. John Kearney Rodgers, the New York Eye and Ear Infirmary. Of this institution he was an attending surgeon for thirty years, and was afterwards elected consulting surgeon and vice-president. He manifested through life the warmest interest in its prosperity, and much of its great success may be credited to his active labors and wise counsels.

In 1834 he was appointed one of the attending physicians of the New York Hospital. In 1825, when comparatively a young man, he was appointed Professor of Obstetrics and Diseases of Women and Children in the College of Physicians and Surgeons, and continued to fill that chair with signal ability until 1838, when his increasing practice obliged him to resign both his professorship and his position at the hospital. He was a founder and the first President of the Society for the Relief of the Widows and Orphans of Medical Men. In 1858 he was elected President of the College of Physicians and Surgeons, and became a member of the Board of Governors of the Roosevelt Hospital. As President and Chairman of the Building Committee, his labors were unwearied in perfecting the organization of the hospital.

As a teacher Dr. Delafield was quiet, clear, methodical in his views; terse, elegant, and distinct in his mode of expressing them. No man more completely held the attention of his class, as in his earnest, dignified, and effective manner he laid before them the truths of medicine, and the great responsibilities involved in the practice of their noble calling.

As a practitioner, Dr. Delafield possessed, in a high degree, the confidence of his patients. His medical sagacity and extensive acquirements secured him success in the management of disease, and the kindly interest and sympathizing care which he felt for those entrusted to his skill gained for him their affection and gratitude.

Dr. Delafield took a prominent part in the organization of this Society in 1864. His unanimous election as its first president was a

fitting acknowledgment of what had been done by his example and efforts, during many years, to make Ophthalmology, as a department of medical practice, honorable in the estimation of the profession and useful to the public.

During the four years that this Society had the privilege of retaining his name at the head of its list of officers, and until the close of his life, Dr. Delafield showed a warm interest in the prosperity of the Society as evidenced in the enlargement of its membership and the increasing value of its published proceedings.

The death of such a man—energetic, skilful, honorable, courteous, as he was—is a loss to the whole community in which he lived; but it must be especially felt by the profession, of which he was so eminent a member, and, above all, by this Society, of which he had been a founder and a constant friend.

ON THE EFFECT OF A CYLINDRICAL LENS, WITH VERTICAL AXIS PLACED BEFORE ONE EYE. By O. F. Wadsworth, M.D., Boston, Mass.

An interesting phenomenon in physiological optics, which, to me at least, is new, was observed in the following case:

Mr. N., a draughtsman, aged 26, consulted me March 6, 1875. The right eye he considered normal. With the left he had never seen well, and it was of little use, but he had noticed no change in it. He hoped a glass might be found to improve the sight of this eye. Functional examination gave: Right, without a glass, V. $=\frac{15}{20}$, with -48 cylinder, axis 135°, V. $=\frac{15}{16}-$. This glass, or $+48$ cylinder, axis 45°, increased somewhat the distance at which he could read $1\frac{1}{2}$ Sn. (18″ to 22″). Left, without glass, V. $=\frac{15}{100}$, with -13 cylinder, axis vertical, V. $=\frac{15}{50}$. The fundus appeared normal in both eyes.

He was advised to procure -13 cylinder, axis vertical, for the left eye, and to wear it a certain time each day, while keeping the right eye covered, in the hope that vision might, by this means, gradually be improved. The improvement for the wearer caused by $+48$ cylinder before the right eye seemed to him sufficient to make it worth while to wear it. The two glasses were therefore ordered—to be placed in separate frames.

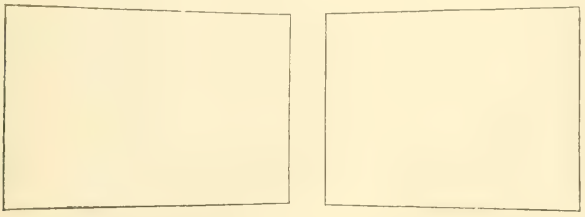
Five days later he came to me again. He had had both glasses placed in the same spectacle frame, and complained that when he kept both eyes open he saw "perspectively," *i.e.*, parallel horizontal lines appeared as if they converged toward a vanishing point at the left hand. I found, on examining him, that this appearance was not very marked, and if the parallel lines were pretty far apart he needed a moment's attention to determine their convergence; still it was enough to decidedly inconvenience him when at work on plans, etc. Very probably but for his training as a draughtsman, which had taught him accuracy of observation as to the mutual relations of lines, the apparent convergence would have passed unnoticed.

The cause of the phenomenon was not at first clear to me, but, on consideration, the following explanation appears satisfactory: When,

both eyes being normal, an object, for example a parallelogram, is held directly in front of the eyes, perpendicular to the visual axis, the separate images formed upon the two retinas are not exactly like either each other or the object. The left end of the parallelogram being nearer the left eye than the right end, its image on the retina of this eye is larger than the image of the right end, and conversely, the image of the right end of the parallelogram is the larger in the right eye. These two unlike images are unconsciously combined in the brain to give a single visual impression, the smaller end of each single image being fused with the larger end of the other. Under the conditions given, the smaller ends of the two images are equal, and the larger ends also equal, so that the average obtained by fusing either large end with the opposite small end is the same, and the impression produced is that of a rectangle.

If, now, a concave, cylindrical glass, with vertical axis, is placed in front of one eye, the image for that eye is shortened in the horizontal direction, a portion being cut off from either end, so that the small end is not so small, or the large end so large as those of the image in the other eye. These two unequal images also are combined in the brain to give a single visual impression. Here, however, the average obtained by the fusion of the large end of the longer image with the small end of the shorter image is greater than that obtained by the fusion of the large end of the shorter image with the small end of the longer image; the resulting impression, therefore, is not that of a rectangle, but of a rhomb lying with its smaller end toward the side of the eye before which the glass is placed.

It is, of course, assumed in the above statement that the image formed by the aid of the cylindrical glass is a distinct one, as would be the case if the glass corrected an existing astigmatism.



To test the correctness of the explanation the accompanying diagrams were constructed.

They represent the outlines of such images of a parallelogram as

would be found on the retinas of the two eyes under the given conditions. When these diagrams are placed in a stereoscope the result of their fusion is to produce the appearance of a rhomb, its narrower end toward the side on which the shorter figure is situated. The experiment, therefore, supports the theoretical explanation.

A CASE OF GENERAL SARCOMA OF THE CHOROID, PROBABLY CONGENITAL. By Dr. R. J. McKay and Dr. H. C. Eno.

On November 23d, 1874, Arthur Pack, aged then one year and ten days, was brought to the "Eye class" of the Out-Door Department of Bellevue Hospital. The mother stated that this was her third child, and that the other two children were healthy. He was born after a natural labor. At birth nothing unusual was observed. But the next day the right eye and right side of the face seemed swollen. They continued to enlarge as he grew older, but never rapidly.

At three and a half months of age he was taken to Dr. Agnew, who advised to let him alone until older, but thought his right eye might subsequently have to be removed. When first brought to me his appearance was striking; the right cheek was much larger than the left, and it hung lower also. There was an exophthalmus of right eye of about half an inch, and the eye was enlarged. It had a very deep anterior chamber, and was in a state of chronic irido-choroiditis. The pupil was somewhat dilated, and very slightly movable under strong light. The sclerotic was thin and bluish in color. The lids of the right eye, and especially the upper one, were very much enlarged, and almost double the size of its fellow. The movements of the right eye, downwards, and outwards, and upwards, and inwards, were very slight. Nothing unusual could be felt by digital pressure around the orbital edges.

A faint red reflex at the upper part of the pupil, when the eye was turned downwards and inwards, was all that could be discovered with the ophthalmoscope. The left eye was markedly intolerant of light. It manifested continual, horizontal, oscillatory movements, which prevented an ophthalmoscopic examination. His mother stated that he had always dreaded light, and had those movements of the left eye, and that he could always see quite well with it. An examination of his mouth showed that the right side of the posterior two-thirds of the bony palate was distended and enlarged, feeling as if some absorption of that bone had occurred. The median line of union of the palate bones curved to the left, and was very high. There was a small poly-

poid growth from the gum of the right upper alveolar ridge, at the junction of the canine and molar regions. The right upper maxilla seemed enlarged in every direction, apparently by distention from a tumor of the antrum, and there was an unusual enlargement and growth of its alveolar portion. Also the right side of the head seemed larger than the left in every way. There seemed to be an occlusion of the right occipital vein, or an unusual growth over its site, of about two inches in length. The right nostril was partially closed. Symptoms of sympathetic ophthalmia of the left eye were well marked, and for its relief, as well as the cosmetic effects, the enucleation of the right eye was proposed, and done December 3, 1874. The operation was easily performed, and not followed by an unusual amount of hemorrhage.

The conjunctiva was not adherent. The muscles were very thin and greatly stretched. The lower orbital wall was pushed up, and its surface slightly convex, which considerably diminished the cavity of the orbit. No tumor was found in the orbit. A tumor occupying the antrum was supposed to be the cause of the diminution in size of the orbital cavity. Two days after enucleation the photophobia had disappeared entirely, and even when the child was taken to the window, he would look out upon the snow. The nystagmus was also less marked, and fixation better. Œdematous swelling of the lids and ocular conjunctiva continued for some days, but disappeared entirely in about two weeks. Patient was not seen again until April 2, 1875. He had done well until within two weeks, when his right upper lid began to turn out again. I learned the child had been recently weaned, and was quite fretful, and considered it due to that, because when he cries the lid turns up more or less. There has been a marked improvement in the appearance of the child. There is now very little nystagmus, and no photophobia. The lower lid looks quite natural, and the upper one is much smaller than when last seen. The marked difference in the two sides of the head has almost entirely disappeared, but the cheek looks larger and hangs lower. The right nostril is slightly larger and more open than the left, whereas it was nearly closed on December 3, 1874. The polypoid growth of the alveolar process is not present, but from the same locality there is an extension from the alveola to the cheek of the same unusual appearances of an alteration of the normal tissues, and a small tumor is felt in the cheek near the angle of the mouth. Several more teeth are observed, and the enamel has fallen off of the left lateral incisor, and the altered appearance of the alveolar surface extends further to the left.

There are some enlarged anterior cervical glands. Patient was seen by Dr. A. Jacobi, who thinks that the disease was probably a sarcoma, which started early in fœtal life from the dental papilla, and that it extends into and encroaches upon the cavity of the antrum.

Dr. H. C. Eno has made a microscopic examination of the eye, and reports as follows:

EXAMINATION OF THE EYEBALL.

The eyeball is very large, measuring 30½ mm. in the antero-posterior diameter, and 25 mm. in the transverse diameter (the usual measurement for a child of this age being 22 mm. by 21 mm.). The cornea is enlarged and protuberant, its horizontal diameter measuring 17 mm. The eye was opened by a section passing through the horizontal meridian. The anterior chamber was found to be very deep, measuring 3½ mm.; the posterior chamber was also deep, measuring about 2 mm., so that the anterior surface of the lens was not less than 5½ mm. from the posterior surface of the cornea. The lens is held in position by the suspensory ligament passing from the surface of the ciliary processes, and is transparent. The vitreous is transparent, and normal in appearance. The retina is in apposition with the inner surface of the choroid throughout the entire extent of the fundus; and the papilla and nerve present no unusual appearance, except a central excavation, which does not extend to the edges of the disk. The choroid, however, is much thickened, especially in the posterior and outer portion of the fundus, where it reaches a thickness of at least 1 mm. In the anterior portion of the eye the choroid is normal in appearance, but becomes gradually thicker as it passes backwards, till it reaches its thickest point about half way between the equator and the nerve-entrance. Around the nerve-entrance the choroidal thickness gradually subsides again. This thickening of the choroid extends, therefore, over at least one-half of the fundus oculi, that is, as seen by the naked eye; microscopically, the entire choroid is slightly thickened, in some places reaching a thickness of 1 mm., in other places scarcely more than the ordinary thickness. The ciliary body is also somewhat thicker than normal, and curiously changed in shape, the ciliary processes being pushed backwards.

Thin sections were made, passing longitudinally through the optic nerve-entrance, choroid, and retina. The nerve appears to be healthy; the retina in this region is atrophic, but there are no marked changes, all the layers, even the ganglion layer and the cone layer, being perfectly preserved. The thickening of the choroid is due to an in-

terstitial deposit of fusiform and round nucleated cells. These cells are present throughout the stroma of the choroid, and are interspersed with occasional pigment cells, and traversed by the larger choroidal vessels. The pigment cells are fusiform or stellate, and are not generally present in large numbers, but vary in quantity in different parts of the choroid. The vitreous lamella of the choroid is everywhere present, and the pigment layer of the retina is intact, and generally attached to the choroid. The chorio-capillaris is also generally present. The spindle-cells are arranged in bundles, which interlace with one another. The round cells are collected in groups; they are large and delicate, having a large nucleus and distinct nucleolus. The appearances are those of sarcoma of the choroid. There is no trace of continuation of the sarcomatous tissue into the sclerotic, or into the nerve, or without the globe, the eyeball being perfectly smooth and without attachments.

The case is one of general choroidal sarcoma, without the formation of a distinct tumor. Inasmuch as the eyeball was enlarged and protruded at the time of birth, and there existed a congenital tumor of the antrum, it is not improbable that the new growth in the choroid also commenced during intra-uterine life.

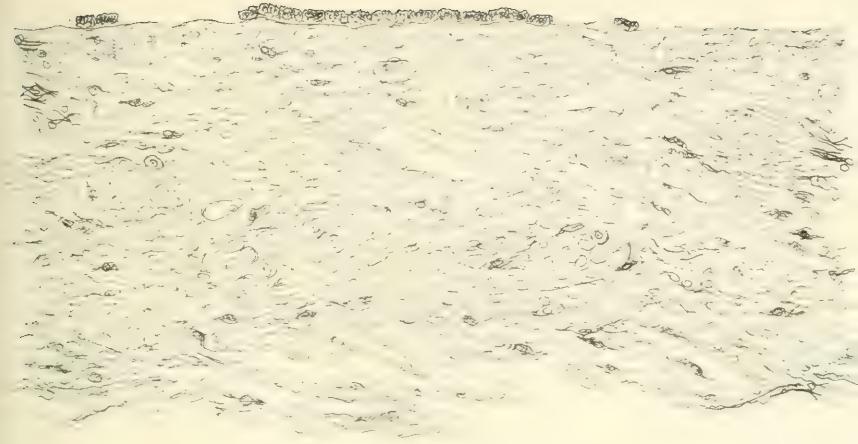


Fig. 1. Section of the Choroid

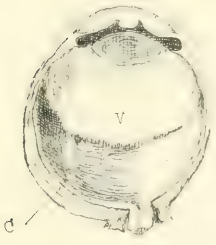


Fig 2 Section of the eyeball - natural size.

C. Choroid - V. Vitreous -

H.C.E No 1c.

A CASE OF CONSECUTIVE ENUCLEATION OF BOTH EYES FOR RECURRING GLIOMA. By C. R. Agnew, M.D., and H. C. Eno, M.D.

A. R., thirteen months old, a very bright, healthy boy, had been observed not to fix his left eye accurately in early infancy. At the age of seven months his mother first saw a yellowish reflex from behind the pupil of the same eye. At the age of thirteen months he came under the observation of Dr. A., who advised immediate enucleation for glioma. At the latter date the cornea was beginning to grow hazy, and the vessels of the ciliary region to show marked hyperæmia. The eye was accordingly enucleated on May 5th, 1874, on the afternoon of the day upon which Dr. A. made the examination and diagnosis. It may be worth mentioning that this child was the first offspring of a married life of seventeen years, that its birth was by forceps, and that over the left brow remained a scar made by the imprint of one of the blades.

The enucleation was by the usual method, care being taken to get as much of the optic nerve as possible, and the recovery was quick, and without drawback of any kind.

On the 1st of November of the same year, or six months after the enucleation of the left eye, the mother observed that the right eye had a peculiar glazed look, having previously been well. On the 20th of November the eye became sightless; was examined by Dr. Agnew, who advised immediate enucleation for glioma of that eye.

In the case of the right eye, as there was no haziness of the cornea, a good view with the ophthalmoscope could be had after the pupil had been widely dilated by atropia. There was a general yellowish reflex from the interior of the eye, crossed by numerous new blood-vessels. There was one large tumor below and to the temporal side, numerous smaller ones scattered over the other portions of the field, and still other minute yellowish masses that were evidently free in what remained of the vitreous humor attached to a very much thinned portion of detached retina.

This second eye was enucleated on the 20th of November, 1874, the child being under ether. As much of the nerve as possible was removed with the eye, and after the enucleation, about a quarter of

an inch of the stump of the nerve was seized by forceps and cut off.

The most interesting part of the case follows, and is contributed by my friend, Dr. H. C. Eno.

On November 3, 1875, the father of the child writes: "He is apparently very well, and exceedingly happy and interesting."

EXAMINATION OF THE LEFT EYE.

The left eye was laid in Müller's fluid, and at the end of two weeks opened by a section passing nearly through the vertical meridian. Its antero-posterior measurement was found to be 23 mm., its transverse measurement 22 mm. The eyeball is normal in size and shape. The cornea is normal in appearance; the iris and lens are pushed tightly up against the posterior surface of the cornea, completely obliterating the anterior chamber. Nearly half of the vitreous chamber is occupied by a yellowish, gray mass of moderately firm consistency: the greater part of this mass lies in the posterior portion of the globe, apparently continuous with the optic nerve, and stretches forward to the posterior surface of the lens, where it again spreads out, sending processes to the inner surface of the ciliary bodies. The completely detached retina may be more or less distinctly seen passing in a wavy course through the centre of this mass from the nerve-entrance to the posterior pole of the lens. The remainder of the vitreous chamber is filled with a gray gelatinous substance (coagulated serum). The choroid and ciliary bodies are in place; the optic nerve is normal in appearance. (*Vide* Fig. 2.) Such are the appearances to the naked eye. The *microscopic examination* shows the new growth in the vitreous chamber to be made up entirely of small, roundish granular cells, and to be of the kind known as glioma of the retina. The tumor contains but few blood-vessels, and very little connective tissue. In the posterior portion of the globe, the retina is to be distinguished only as a band of connective tissue passing through the centre of the new growth, but in the anterior portion it may be more distinctly seen. Here the retina is folded upon itself at the ora serrata in such a manner that its inner surface lies tightly against the inner surface of the pars ciliaris retinæ; it runs along the inner surface of the ciliary body to the lens passing over its posterior surface to the posterior pole of the lens; here it meets the retinal fold from the opposite side, and is reflected directly backwards in the line of the axis of the eyeball. (*Vide* Fig. 1.) This portion of the retina is better preserved, and its layers

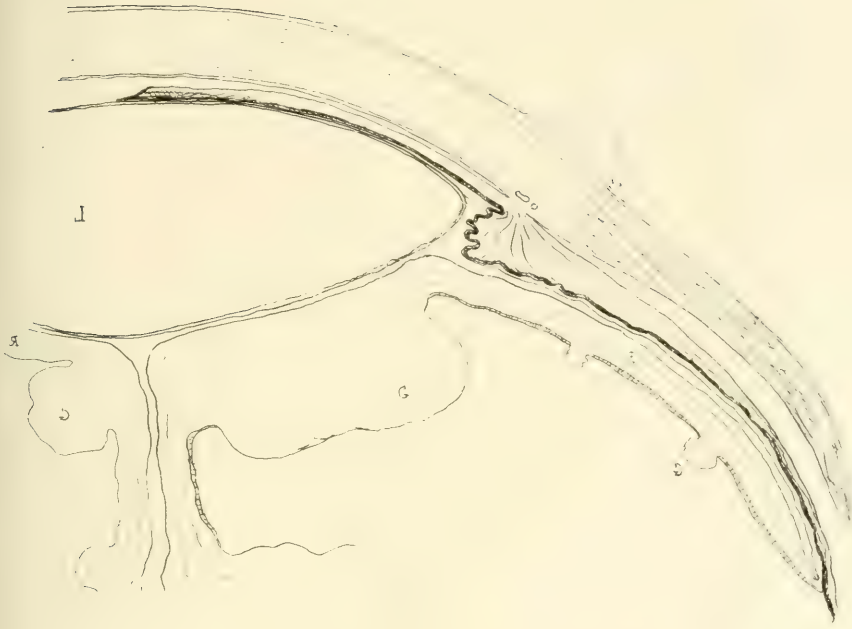


Fig. 1 Showing relations of Retina. Tumor seen in the anterior portion of the Left Eye. L. Lens. R. Retina. G. Glioma.

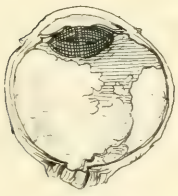


Fig. 2 Section of right eye

Fig 3. Section of left eye

Drawn & Etched on Steel by E. Enc

may all be easily recognized. And here the new growth may be distinctly seen to spring from the retina, arising from the external granular layer (layer of external granules), though in most places all the layers are affected; even where the retina is of normal thickness and the gross appearances of its layers are nearly normal, a high magnifying power shows that all parts are more or less infiltrated with glioma-cells. At the optic nerve-entrance, the new-growth presses against the lamina cribrosa, causing an excavation of the nerve which is filled by glioma-tissue. The lamina cribrosa is infiltrated with glioma-cells, as is the nerve itself, the cells lying both between and within the nerve-bundles: the number of cells becomes smaller at a greater distance from the eyeball, but they are easily found even in the remote portions of the nerve. There is nothing special to remark in respect to the iris, ciliary body or choroid, except some small secondary tumors on the surface of the latter. The sclerotic is everywhere healthy, and the glioma has not passed out of the eyeball except by the optic nerve. The relations of the retina and tumor in the anterior portion of this eyeball are unusual. The retina was probably detached at an early period of the disease, and the nodules of glioma on its outer surface were developed later.

There is nothing of special interest in the examination of the right eyeball. It was opened by a section through its vertical meridian, and the appearances are those represented in Fig. 3. The lens, iris, and choroid are in place, and the vitreous chamber is almost entirely filled with a mass of glioma, through which, in some places, the course of the retina may be indistinctly traced. In this eye the new growth has begun to show retrogressive changes, the tissue of the tumor being less consistent, and the cells having undergone fatty degeneration.

IRIDOTOMY BY VON WECKER'S METHOD. By Dr. J. Green, St. Louis.

I have found the new scissors of von Wecker a most admirable instrument for dividing the iris and pupillary false membranes in the absence of the lens. In one only of six iridotomies performed by the aid of this instrument during the past year, have I observed any trace of iritis, and in this case the operation was repeated with perfect success after an interval of five weeks.

In this case, a peripheric-linear extraction of cataract with lower section and iridectomy, a sudden attack of iritis, with occlusion of the pupil and increased tension of the globe, occurred two weeks after the extraction, all having progressed favorably up to this time. The iris was conspicuously bulged forward, and vision reduced to simple perception of light. A small iridectomy outward relieved the glaucomatous symptoms, but did not arrest the iritis, which resulted in a completely occluded and very eccentric pupil. Five months after the extraction the eye was free from irritation, but only quantitative perception of light remained. Iridotomy (double) was performed, in accordance with von Wecker's precept, making with two strokes of the scissors a V-shaped incision of the iris, with apex downward towards the cicatrix of the extraction wound. The tongue of iris thus formed retracted moderately, leaving a nearly central clear pupil, with vision sufficient to count fingers at two feet five minutes after the operation. The next day the eye was slightly painful, and was tender to the touch; the pupil was no longer clear, and in four days had become again closed by lymph. Five weeks later, after all symptoms of irritation had again subsided, a second iridotomy was performed, in another position and in accordance with another plan.

In cases of occlusion of the pupil from iritis following cataract extraction with iridectomy, a simple inspection of the eye shows that in most cases the radiating fibres of the iris opposite to the excised portion are drawn tightly across from their ciliary attachment to the occluding cicatrix. They are thus in a state of great tension, which shows itself in some cases even by an oval outline of the cornea dependent upon the dragging of the contracting cicatrix through the radiat-

ing fibres of the iris upon the opposite side. This tension, if allowed to continue, must necessarily lead to grave consequences; it should, therefore, be a principal aim in operating to relieve it as completely as possible. This indication is most perfectly fulfilled by a bold linear incision of the iris, behind the centre of the cornea, in a direction at right angles to, and freely dividing all the stretched radiating fibres. The divided tissues may then be expected to retract sufficiently to open out the linear incision into a well-formed and central pupil, not likely to become closed by inflammation, etc.; if so closed, capable of being again opened by a repetition of the operation after all irritation has subsided.

The operation proved to be very easy of execution, and was entirely satisfactory in its effect. A horizontal linear incision, rather less than two lines in length, was made with von Wecker's scissors, dividing all the stretched fibres of the iris, together with all remains of capsule, false membrane, etc., resulting from the former attacks of inflammation; the incision gaped widely as the stretched tissues were divided by the scissors. The immediate effect of the operation was the formation of an oval pupil, nearly central, with a horizontal diameter of about a line and a half and a vertical diameter of somewhat less than a line. There was no bleeding of consequence, and the patient immediately counted fingers at five feet aided by a $+\frac{1}{4}$ lens. The eye recovered with scarcely any irritation, and two months after the operation the pupil was perfectly clear and of about the same dimensions and general form as at first. V. $=\frac{16}{\text{LXIV}}$.

In von Wecker's operation, as applied to aphakial eyes with occluded pupil, the avoidance of all dragging upon the tissue of the iris and upon its ciliary attachments recommends it as unquestionably and immensely superior to all the older plans for performing iridotomy—from iridectomy it has, in addition, the very important advantages of being easier of execution, and of leaving the eye in a much more favorable condition for a repetition of the operation, if not successful the first time. The one principle to be remembered in its application is to place the incision so as to divide, at right angles to their direction, such fibres of the iris as upon inspection are seen to be in a state of abnormal tension. By observing this rule I believe that much better results can often be attained by a single linear stroke of the scissors, than by the V-shaped incision recommended by von Wecker under the name of "iridotomie double."

NOTES ON THE EXAMINATION OF THE EYES OF A CRIMINAL EXECUTED BY HANGING. By Dr. J. Green, St. Louis.

In the Transactions of this Society, for 1866 and 1869, Dr. E. Dyer has reported the results of the examination of the eyes of five criminals executed by hanging. Of the ten eyes, one, the subject of cataract, suffered dislocation of the opaque lens downward and outward, rupturing a posterior synechia. Of the other nine eyes, six appeared to have sustained fracture of the lens, or rupture of the anterior capsule. In one of the five men the only lesion detected was the dislocation of the cataractous lens; in two others a positive or probable rupture of one lens or capsule was made out, while in the remaining two rupture of the capsule or fractures of the lens occurred in both eyes. Of three dogs, hanged experimentally, the first dog presented the same lesion in both eyes, the second dog in neither eye, and the third dog in one eye only. In six observations upon rabbits, killed by hanging, or by strangulation, the results were all negative.

In April, 1875, Patrick O'Shea was executed, by hanging, in St. Louis. The unusual drop of between seven and eight feet was given, and he died quickly and without struggle. His eyes were examined at intervals, beginning half an hour after the drop and ending at the expiration of a little over an hour. The ophthalmoscope and oblique illumination, using both ordinary artificial light and also direct sun-light which happened to be available, failed to show any trace of lesion either of the capsule or lens, in either eye. There were numerous small conjunctival ecchymoses, but the optic disk and retina, which were distinctly visible, failed to show any sign of vascular lesion.

CASTOR-OIL AS A MENSTRUUM FOR DISSOLVING ATROPIA FOR APPLICATION TO THE EYE. By Dr. J. Green, St. Louis.

Oil dropped into the eye appears to be of occasional service in recent abrasions and some other affections of the cornea, and in most of these cases atropia is also indicated. Having witnessed, about a year ago, the unsuccessful attempt of an apothecary to prepare a prescribed solution of sulphate of atropia in castor-oil, I suggested that the desired end might be attained by the substitution of the alkaloid for the salt, and upon trial, I arrived at a formula which may, perhaps, be thought worth reporting.

Dissolve one grain of atropia in two minims of strongest alcohol, and mix with fresh castor-oil, in any quantity, from half a drachm or less to an ounce, according to the strength desired. It is well to expose the stronger solutions for a short time to a gentle heat in a water bath, in order to drive off a part of the alcohol, which otherwise renders the application somewhat irritating to the surface of the eye.

In this way it is easy to prepare a clear and permanent solution of atropia in castor-oil, of any strength, from $\frac{1}{1}\frac{1}{5}$ to $\frac{1}{4}\frac{1}{8}\frac{1}{0}$ or weaker. I have found it to be practically unirritating to the abraded or inflamed cornea, and I believe that it is occasionally to be preferred to the aqueous solution of the sulphate. It has seemed to be most useful in recent abrasions and painful phlyctenulæ and ulcers of the cornea, with or without iritis. In cases of photophobia, with excessive flow of tears, I have often applied it to the conjunctival surface of the everted upper lid, a plan which seems to ensure a longer contact of the remedy with the cornea than is the case when aqueous solutions are dropped into the conjunctival sac.

IMPROVEMENTS IN SPECTACLE FRAMES. By Henry D. Noyes, M.D., New York.

The following contrivances have been made by the optician, Mr. William Hunter, of New York, to meet certain special requirements in spectacle frames.

Reversible Frames.—For a person having the use of only one eye and who needs two glasses for different kinds of vision, it has been customary to make a frame whose bridge is on a line with the transverse diameter of the glasses, and which is reversed by turning it over in a plane parallel to the surface of the face. This is the kind of frame worn by patients who have had a cataract operation upon only one eye. The inconvenience attending this arrangement is that the bridge is not equally fitted to the use of the glass for distant and for near sight. If the nose be prominent, this may be exceedingly awkward. Moreover, in wearing cataract glasses, the person's comfort is promoted by having the frames light, and by having the arms turned over so as to hook behind the ears. The accomplishment of these objects has been secured by joining each arm to the body of the frame by two hinges which are close together. Each arm can then be made to sweep through a complete circle, and the glasses reversed by turning the frame in a plane parallel to the ground.

This does not reverse the bridge, which may be as concave as needed by the shape of the nose, and permits the arms to hook over the ears.

Another device which accomplishes the same object is to use a ball-and-socket joint for attaching the arms to the frame. This permits the arms to hook over the ears, but compels the employment of a horizontal bridge.

Double glasses.—For glasses of short focus a difficulty arises because of the great amount of aberration inseparable from their spherical curvature. If the patient look through the centre of the glass this error is small, but to do this renders fluent reading impossible. The eye cannot glance along the line and anticipate the words. I have been able to abate this annoyance by putting together two plano-convex lenses each of half the needful focus, with their convex sides toward each other. This well-known optical device has been found

satisfactory in several instances. The obvious need of making the spectacles as weightless as possible, has been well achieved. One frame is by a simple mechanism made to fasten to the other, and is easily separable from it, so as to permit cleaning. This suggestion of doubling the spectacle glasses permits other applications. For instance, if a cylindric glass is needed and near vision requires a glass of power different from that needed for distance—the glass for most frequent use may be made cylindric, and the one for occasional use may have a spherical curve, either plus or minus. The question is simply one of convenience and expense.

APPENDIX.

REMARKS OF DR. HENRY D. NOYES IN CONNECTION WITH DR. WEBSTER'S PAPER (see p. 284).

Among forty-three cases of sub-retinal effusion in private practice, I find one in which the fluid was spontaneously absorbed. In another case which I saw, in consultation with Dr. Simrock, and which I do not include, this happy result also took place.

The case of spontaneous cure is as follows:

Oct. 11, 1864.—Mr. C. M. J., an engraver, aged about 32, with myopia $\frac{1}{2}$, came to me, stating that, five days before, the sight of one eye suddenly became troubled, and in a few days he discovered that in certain parts of the field it was entirely destroyed. This occurred without pain, or without any uncommon straining of his eyes. He said that 16 years before this eye was struck by a bit of wood, and its sight was destroyed for a month, but it subsequently became entirely well.

I found that at present vision amounted only to perception of light, and could see in the fundus a transparent effusion lifting up the upper and outer part of the retina. I could not discover any rent in the membranes. The vitreous moderately hazy.

No serious treatment was advised, except to abstain from use of eyes, to wear dark-blue glasses, to use a mild diuretic.

On the 15th, as he subsequently reported, a change occurred, by which his sight improved.

On the 18th he could, with -10, count fingers at 8 feet ($V. = \frac{8}{200}$). The vitreous was very hazy, and the retina had been restored to its place.

On the 20th, eye again examined, and found numerous opacities in vitreous, and could dimly see the optic nerve. In the upper and outer part of fundus the retina was traversed by

distinct horizontal folds, or ripples, as if, when reapplied to the surface, it had not been smoothly stretched. I could also see a small, nearly vertical line, which had the look of a laceration. In the vicinity were whitish spots and pigment granules, as if caused by an old choroiditis, such as might be accounted for by the blow received 16 years before.

Vision continued to improve, and in two months he could use his eye almost as well as before the sub-retinal effusion. But he had an annoying metamorphopsia. In looking at a row of vertical parallel lines, one or two of them had a nick, as in *figure*. It was not always precisely the same, but was never absent.

It will be noted that the improvement in sight came two weeks after the effusion occurred, and that the sac occupied the upper part of the globe, in which condition gravitation would favor a rupture of the retina, and diffusion of the fluid.

In two cases of sub-retinal effusion, I punctured the sac per scleram. The result was negative, or an aggravation of the condition.

NOTE.—It is to be regretted that, on account of the illness of Dr. Althof, we are unable to furnish the notes of eight cases of sub-retinal effusion, in all of which a spontaneous cure was observed. These cases, which derive additional interest from the fact, that many of them have been observed through a period of years, will be published in the next transactions of the Society.

RICHARD H. DERBY, *Secretary*.

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OF THE

AMERICAN

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MEMBERS

OF THE

AMERICAN OPHTHALMOLOGICAL SOCIETY.

ACTIVE MEMBERS.

Dr. F. W. Abbott.....Buffalo, N. Y.
Dr. C. R. Agnew.....New York, N. Y.
Dr. Joseph Aub.....Cincinnati, O.
Dr. Edwin W. Bartlett.....Milwaukee, Wis.
Dr. Charles S. Bull.....New York, N. Y.
Dr. F. Buller.....Montreal, Canada.
Dr. Peter A. Callan.....New York, N. Y.
Dr. W. H. Carmalt.....New Haven, Conn
Dr. David Coggin.....Salem, Mass.
Dr. H. Culbertson.....Zanesville, O.
Dr. Francis Delafield.....New York, N. Y.
Dr. W. S. Dennett.....Boston, Mass.
Dr. Hasket Derby.....Boston, Mass.
Dr. Richard H. Derby.....New York, N. Y.
Dr. John H. Dix.....Boston, Mass.
Dr. Lewis S. Dixon.....Worcester, Mass.
Dr. Abram Du Bois.....New York, N. Y.
Dr. E. Dyer.....Pittsburgh, Pa.
Dr. E. T. Ely.....New York, N. Y.
Dr. Henry C. Eno.....New York, N. Y.
Dr. C. S. Fenner.....Louisville, Ky.
Dr. John Green.....St. Louis, Mo.
Dr. Emil Gruening.....New York, N. Y.
Dr. A. D. Hall.....Philadelphia, Pa.

Dr. George C. Harlan.....Philadelphia, Pa.
Dr. Gustavus Hay.....Boston, Mass.
Dr. Albert G. Heyl.....Philadelphia, Pa.
Dr. Edward L. Holmes.....Chicago, Ill.
Dr. Lucien Howe.....Buffalo, N. Y.
Dr. Edwin Hutchinson.....Utica, N. Y.
Dr. B. Joy Jeffries.....Boston, Mass.
Dr. Samuel J. Jones.....Chicago, Ill.
Dr. Charles J. Kipp.....Newark, N. J.
Dr. H. Knapp.....New York, N. Y.
Dr. W. S. Little.....Philadelphia, Pa.
Dr. Edward G. Loring.....New York, N. Y.
Dr. F. B. Loring.....Washington, D. C.
Dr. W. V. Marmion.....Washington, D. C.
Dr. Arthur Mathewson.....Brooklyn, N. Y.
Dr. S. F. McFarland..... Oxford, Chenango Co., N. Y.
Dr. R. J. McKay.....Wilmington, Del.
Dr. C. S. Merrill.....Albany, N. Y.
Dr. H. G. Miller.....Providence, R. I.
Dr. T. G. Morton.....Philadelphia, Pa.
Dr. Russell Murdoch.....Baltimore, Md.
Dr. William F. Norris.....Philadelphia, Pa.
Dr. Henry D. Noyes.....New York, N. Y.
Dr. J. F. Noyes.....Detroit, Mich.
Dr. Charles I. Pardee.....New York, N. Y.
Dr. A. Per Lee Pease.....Massillon, O.
Dr. Thomas R. Pooley.....New York, N. Y.
Dr. J. S. Prout.....Brooklyn, N. Y.
Dr. Wm. Rankin.....Newark, N. J.
Dr. Charles E. Rider.....Rochester, N. Y.
Dr. C. A. Robertson.....Albany, N. Y.
Dr. D. B. St. John Roosa.....New York, N. Y.
Dr. Jno. D. Rushmore.....Brooklyn, N. Y.
Dr. W. W. Seely.....Cincinnati, O.
Dr. Henry L. Shaw.....Boston, Mass.
Dr. Francis Simrock.....New York, N. Y.
Dr. A. G. Sinclair.....Detroit, Mich.

Dr. J. A. Spalding.....Portland, Me.
Dr. Francis P. Sprague.....Boston, Mass.
Dr. George T. Stevens.....Albany, N. Y.
Dr. George Strawbridge.....Philadelphia, Pa.
Dr. William Thomson.....Philadelphia, Pa.
Dr. J. J. B. Vermyne.....New Bedford, Mass.
Dr. O. F. Wadsworth.....Boston, Mass.
Dr. David Webster.....New York, N. Y.
Dr. Robert Willard.....Boston, Mass.
Dr. Charles H. Williams.....Boston, Mass.
Dr. E. Williams.....Cincinnati, O.
Dr. Henry W. Williams.....Boston, Mass.

Total..... 73

HONORARY MEMBERS.

Dr. G. A. Bethune.....Boston, Mass.
Dr. Isaac Hays.....Philadelphia, Pa.
Dr. R. W. Hooper.....Boston, Mass.
Dr. E. Reynolds.....Boston, Mass.
Dr. C. Schweigger.....Prussia.

Total.....5

Whole Number.....78

MINUTES OF THE PROCEEDINGS.

TWELFTH ANNUAL MEETING.

NEW YORK, *September 11th*, 1876.

THE meeting was called to order by the President, Dr. C. R. AGNEW, at 10.50 A.M. The minutes of the last meeting were read and approved. The Society then went into executive session. The chair appointed a committee on the election of new members, to consist of Drs. Althof, Noyes, Roosa, Bull, and Dyer.

The Report of the Treasurer was then read and referred to an auditing committee, Drs. Carmalt and Mathewson. This committee reported the Treasurer's account correct, and it was accepted.

The Treasurer moved that the assessment for 1876 7 be omitted. This motion was seconded and carried.

The Treasurer moved that the names of members in arrears to the Society for three years be stricken from the list, except in case of those absent from the country, and three months after notification of this motion had been served upon such members. This motion was seconded and carried.

Dr. Dyer and the Secretary, who were appointed a committee to prepare a minute on the death of Dr. John Jeffries, submitted the following:

Dr. John Jeffries, one of the first elected Honorary Members of the American Ophthalmological Society, died in Boston, July 16, 1876, in the eighty-first year of his age. Dr. Jeffries was the son of Dr. John Jeffries, a distinguished surgeon of Boston. He went to Harvard College, and was graduated in the class of 1815, and in 1819 he received the degree of Doctor of Medicine. He served the city of Boston on the

Board of Consulting Physicians for several years, during which he earnestly strove for the establishment of a properly organized Board of Health. Dr. Jeffries was one of the founders of the Massachusetts Charitable Eye and Ear Infirmary, and for eighteen years was one of its surgeons. Besides his special work in ophthalmic surgery, he had a large general practice. He practised in Boston for fifty-six years, and died universally respected and beloved as man and physician.

The resignations of Dr. F. J. Bumstead and Dr. E. Curtis were presented and accepted.

Dr. Roosa moved that a committee of five be appointed to act in conjunction with the committee of the International Congress. This motion was seconded and carried, and the chair appointed Drs. Williams (Boston), Dyer, Green, Thomson, and Rider.

The Committee on Membership reported favorably on the names of—

Dr. Wm. Rankin, of Newark, N. J.
Dr. A. Per Lee Pease, of Massillon, Ohio.
Dr. Peter A. Callan, of New York, N. Y.

These gentlemen were unanimously elected.

Dr. Roosa moved that a committee be appointed, to consist of the President and Secretary of the Society and of five other members, to arrange the place of meeting for next year. This motion was seconded and carried. The chair appointed Drs. J. F. Noyes, J. Green, E. Williams, E. Dyer, and H. W. Williams.

The Committee on Membership was charged with the nomination of officers for the ensuing year. The committee reported the following names:

For President—Dr. C. R. Agnew, New York.
Vice-President—Dr. G. Hay, Boston.
Recording Secretary and Treasurer—Dr. Richard H. Derby, New York.
Corresponding Secretary—Dr. H. Althof, New York.
Publishing Committee—Dr. H. D. Noyes, New York.
Dr. E. G. Loring, "

Dr. Agnew begged leave to withdraw his name ; but this was not allowed. These names were balloted on, and the gentlemen were unanimously elected.

Dr. Green moved a suspension of the By-Laws in reference to the time of the next annual meeting. This motion was seconded and carried.

Dr. Green moved that the time as well as the place of meeting be submitted to the same committee. Seconded and carried.

Adjourned.

RICHARD H. DERBY, *Secretary.*

The following members were present at the meeting of September, 1876 :

DR. C. R. AGNEW.....New York.
DR. H. ALTHOF.....New York.
DR. C. S. BULL.....New York.
DR. W. H. CARMALT.....New Haven, Conn.
DR. D. COGGIN.....Salem, Mass.
DR. RICHARD H. DERBY.....New York.
DR. LEWIS S. DIXON.....Worcester, Mass.
DR. E. DYER.....Pittsburgh, Pa.
DR. C. S. FENNER.....Louisville, Ky.
DR. JOHN GREEN.....St. Louis, Mo.
DR. EMIL GRUENING.....New York.
DR. E. L. HOLMES.....Chicago, Ill.
DR. SAMUEL J. JONES.....Chicago, Ill.
DR. ARTHUR MATHEWSON .....Brooklyn, N. Y.
DR. S. F. MCFARLAND.....Oxford, N. Y.
DR. R. J. MCKAY.....New York.
DR. H. G. MILLER.....Providence, R. I.
DR. H. D. NOYES.....New York.
DR. J. F. NOYES.....Detroit, Mich.
DR. OREN D. POMEROY.....New York.
DR. J. S. PROUT.....Brooklyn, N. Y.
DR. WM. RANKIN.....Newark, N. J.
DR. D. B. ST. JOHN ROOSA.....New York.
DR. J. J. B. VERMYNE.....New Bedford, Mass.
DR. D. WEBSTER.....New York.
DR. H. W. WILLIAMS.....Boston, Mass.

THIRTEENTH ANNUAL MEETING.

NIAGARA FALLS, *July 26th*, 1877.

The Society met at the Cataract House, at 10 A.M. In the absence of the President, Dr. H. D. Noyes was appointed chairman. Six members were present—Drs. H. Derby, R. H. Derby, J. Green, H. D. Noyes, J. F. Noyes, and G. T. Stevens. There being no quorum, the meeting was adjourned.

RICHARD H. DERBY, *Secretary.*

FOURTEENTH ANNUAL MEETING.

NEWPORT, *July 25th*, 1878.

The Society held its Fourteenth Annual Meeting at the Aquidneck House, at 10.30 A.M. The President, Dr. Agnew, in the chair. The minutes of the last two meetings were read and approved. Upon the motion of Dr. H. W. Williams, Drs. E. G. Loring and C. S. Bull were appointed a committee to prepare a minute on the death of Drs. Herman Althof and George Wilkes.

The following gentlemen were appointed by the chair a Committee on Membership: Drs. H. W. Williams, J. Green, W. Thomson, H. G. Miller, and Arthur Mathewson.

The Report of the Treasurer was read, and referred to an Auditing Committee, consisting of Drs. Strawbridge and Stevens.

The Committee on Membership was charged with the nomination of officers for the following year.

The President appointed as a Committee on Bulletin, Drs. Merrill, Vermyne, and Wadsworth.

The President asked that his own name might not be considered as a candidate for re-election to office.

Dr. H. W. Williams proposed this amendment to the By-Laws,—after the first clause of By-Laws, and to take the place of the second paragraph :

"All nominations shall be made in open meeting by two members of the Society, and shall be referred to the Committee on Membership, who may report on each name as they shall think proper ; such report to be made at the next annual meeting following that at which the nomination is made. But the proposers of any name may, after the report of this committee has been received, bring such name before the Society."

This motion was seconded, and, in accordance with the By-Laws, was ordered to lie over until the next session of the Society.

The Committee on Bulletin reported, and the President called for a paper by

1. Dr. Mathewson : "Nitrous Oxide as an Anæsthetic in Strabismus Operations."

2. Dr. Strawbridge : "Ophthalmic Contributions ; a Case of Glioma; Cyst of the Iris ; a Congenital Malformation of Conjunctiva resembling Pterygium ; remarks on Secondary Cataract Operations, with presentation of a new Instrument."

3. Dr. Roosa presented by title a paper on "The Relations of Blepharitis Ciliaris to Ametropia." Also

4. "A Case of Anæmia of the Retina, apparently Caused by Cinchona-Poisoning."

5. Dr. Prout : "Lachrymal Conjunctivitis."

6. Dr. H. W. Williams : "The Abuse of Mydriatics."

7. "A Case of Excision of Ossified Choroid without Enucleation."

8. Dr. Bull : "Two Cases, illustrating rare Diseases of the Eyelids."

9. Dr. Webster : "A Case of Spontaneous Cure of Subretinal Effusion." Some discussion ensued upon the reading of this paper, and the impression of several speakers was that, in the treatment of subretinal effusion by the recumbent atti-

tude, it was the rest that accomplished the relief, and not the supine position.

The committee, appointed to audit the Treasurer's Reports for 1877–1878, found them correct, and they were accepted.

Adjourned at 2.30 P.M.

July 25th.

Evening Session at 7.45. In the absence of the President, Dr. Carmalt in the chair. The minutes of the morning meeting were read and approved.

10. Dr. Vermyne : "A Case of Rupture of the Sphincter Pupillæ."

11. Dr. R. H. Derby : "A Case of Tumor of the Conjunctiva, with Drawing, Simulating Cyst."

12. Dr. Dixon : "Cases of Retinitis Albuminurica; Embolism of Central Artery of Retina and Sarcoma of both Eyes."

13. Dr. Bull : "A Case of Syphilitic Gumma of the Conjunctiva."

14. Dr. Wadsworth : "Intraocular Circulation."

The Society went into executive session. The following officers were elected for the ensuing year :

President—DR. H. D. NOYES, New York.
Vice-President—DR. W. F. NORRIS, Philadelphia.
Recording Secretary and Treasurer—DR. RICHARD H. DERBY, New York.
Corresponding Secretary—DR. J. S. PROUT, Brooklyn.
Committee on Publication—DR. E. G. LORING, DR. D. B. ST. JOHN ROOSA, } New York.

The resignations of Dr. C. M. Allin and Dr. H. C. Newton were presented, and accepted.

Dr. Roosa moved that, as the sense of this Society, resi-

dence in Canada was not a disqualification for membership. This motion was seconded, and carried.

The following gentlemen were then elected members of the Society:

Dr. E. T. Ely, New York.
Dr. F. B. Loring, Washington.
Dr. F. W. Abbott, Buffalo.
Dr. W. S. Dennett, Boston.
Dr. J. A. Spalding, Portland.
Dr. W. S. Little, Philadelphia.
Dr. W. V. Marmion, Washington.
Dr. H. Culbertson, Zanesville, O.
Dr. Lucien Howe, Buffalo.
Dr. F. Buller, Montreal.

The motion to amend the By-Laws, made by Dr. Williams, was now considered. Dr. Green moved that this clause be added to the amendment offered by Dr. Williams:

"The Secretary shall, soon after each annual meeting, send to each member of the Society a list of the names of all candidates proposed for membership, together with the names of proposers and of the members of the Committee on Membership."

This amendment, together with that of Dr. Williams', was seconded and carried.

Dr. Loring offered the following resolution:

"That all papers shall be referred to the Secretary and Publishing Committee, who shall have the power to select such papers as may seem worthy in their estimation of being read before the Society. That such papers shall be so referred one month before the meeting. That the Secretary shall be directed to prepare a bulletin of such papers, which shall be forwarded to each member of the Society as soon as the decision of the Committee is rendered."

This resolution was seconded.

The report of the Committee, recommending Newport as the place for the next annual meeting, was accepted.

Adjourned.

Morning Session at 9.45. The President, Dr. Agnew, in the chair. The minutes of the last session were read, and approved.

15. Dr. Vermyne: "Photopsy from an Injured Eye, persisting Six Months after Enucleation."

16. Dr. E. G. Loring read by title a paper on "Strabismus."

17. "Disappearance of Lenticular Opacities."

18. "Visual Purple."

19. Dr. Roosa: "Examination under Atropia of the Refractive State of Eyes with Normal Vision and which have never been affected with Asthenopia or Inflammation."

20. Dr. Thomson: "A New Method for the Rapid Determination of the Refraction without Glasses, with Demonstration of an Instrument."

21. Dr. J. Green: "On Some Improvement in Instruments for Diagnosis: 1st. Tests for Astigmatism. 2d. A Modification of Dr. Loring's Ophthalmoscope. 3d. Remarks on the Test Set of Glasses. 4th. Tests for Binocular Vision. The Chromatic Aberration of the Eye."

22. Dr. Stevens: "Enucleation of an Eyeball, followed by immediate and marked Reduction of the Amount of Urine passed in a Case of Diabetes Insipidus." Dr. Agnew suggested that, as ether had been given before the operation, this might have been the cause of the suppression of the urine. No microscopical examination of the urine had been made, the author stated, in reply to questions from the President.

23. Dr. Webster: "The Consanguinity of Parentage and Heredity in Retinitis Pigmentosa."

24. Dr. Jeffries: "The Relative Frequency of Color-Blindness in Males and Females."

Dr. Jeffries also explained the practical use of Holmgren's Method of Testing for Color-Blindness.

25. Dr. Agnew: "A New Instrument for Operation on the Lachrymal Passages."

26. "Cases of Ophthalmic Disease, in which enforced Exposure of the Eyes to the Light and Air was Salutary."

27. Dr. E. G. Loring: "A new Modification of the Ophthalmoscope," and "An Artificial Eye (Phantom) representing the Combined System."

All the papers read were referred to the Publishing Committee, with power.

The following minute of the death of Dr. Geo. Wilkes was offered:

Dr. George Wilkes, an Honorary Member of the American Ophthalmological Society, died November 30, 1876, at the age of 76 years. Dr. Wilkes was appointed a Surgeon of the New York Eye and Ear Infirmary in 1832, and held this office until 1852, when he resigned. At that date he became one of the Consulting Surgeons of the Infirmary. For many years he was identified with ophthalmic practice in his native city. Dr. Wilkes was well known as a general practitioner.

The Committee on Membership recommended that the Society should limit its number of members to eighty. This amendment to the By-Laws was seconded, and ordered to lie over to the next meeting.

Dr. H. W. Williams moved that, while the Committee on Nominations accepted the suggestion of Dr. Agnew, he should not again be considered a candidate for office, the Society express their sense of the dignity with which Dr. Agnew had filled the position of President. This motion was seconded, and carried. Adjourned.

Richard H. Derby,
Recording Secretary.

The following members were present at the meeting of July, 1878:

Dr. C. R. Agnew.....New York.
Dr. E. W. Bartlett.....Milwaukee, Wis.
Dr. C. S. Bull.....New York.
Dr. W. H. Carmalt.....New Haven.
Dr. Richard H. Derby.....New York.
Dr. L. S. Dixon.....Worcester, Mass.
Dr. John Green.....St. Louis, Mo.
Dr. B. Joy Jeffries.....Boston.
Dr. E. G. Loring.....New York.
Dr. F. B. Loring.....Washington, D. C.

Dr. A. Mathewson.....Brooklyn, N. Y.
Dr. C. S. Merrill.....Albany, N. Y.
Dr. H. G. Miller.....Providence, R. I.
Dr. O. D. Pomeroy.....New York.
Dr. J. S. Prout.....Brooklyn, N. Y.
Dr. D. B. St. John Roosa.....New York.
Dr. F. P. Sprague.....Boston.
Dr. George T. Stevens.....Albany.
Dr. George Strawbridge.....Philadelphia.
Dr. William Thomson.....Philadelphia.
Dr. J. J. B. Vermyne.....New Bedford, Mass.
Dr. O. F. Wadsworth.....Boston.
Dr. D. Webster.....New York.
Dr. H. W. Williams.....Boston.

DR. ALTHOF.

DR. ALTHOF, one of the founders of the AMERICAN OPHTHALMOLOGICAL SOCIETY, died January 15, 1877. His portrait has been placed among the archives of the Society, as a token of the respect and affection of his fellow-members.

The following brief sketch of his life will be interesting to those who are unacquainted with his earlier career :

HERMAN ALTHOF was born in the province of Lippe-Detmold, Germany, in 1835. He came first to this country in 1845, but returned to Germany to complete his academic education and to study his profession. He passed his examination in Berlin, and took his doctorate in 1858. In his preparatory medical studies he spent a year at Paris. As soon as he passed his examination in Germany he returned to this country, arriving in New York in 1858. After an interval of two years he again went back to Germany, spending several months in microscopical work with Heinrich Müller, afterward becoming one of Graefe's assistants in Berlin.

On DR. ALTHOF'S return to New York he became connected with the German Dispensary, and shortly after one of the Surgeons to the German Hospital. In 1862 he became connected with the New York Eye and Ear Infirmary, as Curator and Microscopist ; in 1864 full Surgeon ; and again, in 1875, Executive Surgeon. He was one of the founders of the New York Ophthalmological Society, and twice its President.

Through a modesty which may be fairly considered excessive, he published but very little ; but his fidelity to duty, his learning and skill, his varied accomplishments, his utter unselfishness, and his manly love of truth in every phase of his existence, impressed everybody with whom he came in contact, and exerted an influence over the Society of which he was an honored member, as beneficial as it was forcible.

NOTES ON THE USE OF NITROUS OXIDE AS AN ANÆSTHETIC IN STRABISMUS OPERATIONS. By Dr. Arthur Mathewson, Brooklyn.

The use of nitrous oxide as an anæsthetic for other operations than those of dentistry has been the subject of frequent discussion in medical societies and journals, and especially of late, since the apparatus for its administration has been so much improved; but, so far as I am aware, no cases in which it has been employed in ophthalmic surgery have been *reported*, with the exception of one referred to by Dr. Jeffries, in a paper read before this Society, in 1871, in which he employed it for doing Passavant's operation. He commends it highly, his patient suffering none of the disagreeable consequences which had been caused by previous administration of ether.

My friends, Drs. Giberson and Rushmore, of Brooklyn, had each recently used it in cases of amputation, where the patients were so feeble that they hardly dared to administer the other anæsthetics, and had found that, after being kept under its influence for from twenty-five to thirty minutes, they recovered consciousness almost immediately, had no trouble from vomiting, and were left in a very satisfactory condition.

Learning from these cases within my own personal knowledge, and from others of which I had read, how easily and with what apparent safety the full anæsthetic effect of nitrous oxide could be kept up for a period more than long enough for any ordinary strabismus operation, and how speedily the effect passed away, it occurred to me that this agent would offer special advantages as an anæsthetic in strabotomy over chloroform or ether. As we all know, the effect of these latter is often slow in passing away, and it may be a long time before the patient is in a condition to enable us to satisfactorily test the effect of the operation, so as to decide whether it is best to operate on the other eye, to dissect more freely, or to use sutures to increase or diminish the effect of the dissection—a most desirable thing, as every operator must concede. The sense of suffocation caused by ether, too, with the attendant resistance, struggling, and other dis-

agreeable symptoms, are not to be too lightly thought of, especially in case of delicate, nervous children with excitable parents.

These were the *à priori* considerations which led me to think favorably of nitrous oxide as an anæsthetic in strabotomy; and the following cases show my experience with it:

CASE I.—Miss A. Mc., æt. 23, the subject of convergent strabismus, had been operated on for its relief by another surgeon previous to coming under my care, and by myself on January 2, 1878. There was still a slight degree of convergence remaining; and to correct this she was put under the influence of nitrous oxide, February 12, 1878, by Dr. George F. Brush, an expert in its use, and tenotomy of the internal rectus of the right eye performed. The patient was fully anæsthetized in two minutes, and the operation finished in two minutes more—the matted condition of the tissues resulting from previous operations rendering it difficult to complete the dissection more quickly. The inhalation of the nitrous oxide was kept up during the whole time, thus occupying four minutes. The unconsciousness passed off at once, so that the effect of the operation could be fully tested, and within five minutes from the time she began the inhalation the patient rose from the operating-chair and was ready to walk home without assistance. She felt no pain during the operation, and there were no unpleasant after-effects, as on previous occasions, when the ether had made her sick for two or three days. The ether had also produced very disagreeable sensations of suffocation; while the sensations caused by the nitrous oxide were, according to her statement, rather agreeable than otherwise.

CASE II.—Miss M. G., æt. 22, was put under the influence of nitrous oxide for operation for correction of convergent strabismus, by Dr. Brush, at his office, February 16, 1878. Drs. Giberson and Hesse assisted me, and the former took accurate note of the time. She was fully anæsthetized in one minute; tenotomy of the left internal rectus was done in one minute more; and forty-five seconds after removal of inhaling apparatus (which had only covered the mouth, not the nose, during a part of the time) she had completely recovered consciousness, so that the effect of the operation could be tested. There was no vomiting or other unpleasant after-effects.

CASE III.—Miss A. C., æt. 8—convergent strabismus; May 30, 1878—was completely anæsthetized by nitrous oxide, administered by Dr. Brush, in one and a half minutes; tenotomy of internus of O. D. performed in one and a half minutes. Recovery of conscious-

ness almost instantaneous, so that effect of operation could be tested. This patient had dined just previous to the operation, and there was some vomiting afterward. A few weeks later tenotomy of the left internus was performed. The nitrous oxide was given on this occasion more slowly, *i. e.*, mixed with more air, and the patient was anæsthetized in three minutes. The operation, including introduction of suture, occupied one minute and fifty seconds. There was some vomiting afterward.

CASE IV.—James D., æt. 22—convergent strabismus—operated on May 28, 1878. Anæsthetized in two minutes. Tenotomy of right internus in one and a half minutes; interval of one and a half minutes; tenotomy of left internus one minute; no vomiting or other unpleasant after-effects.

CASE V.—E. C., boy of 6 years—strabismus convergens. Anæsthesia obtained in one and a half minutes; tenotomy of both interni occupied three minutes. Consciousness restored at once, and effect of operation tested after a minute or two. No unpleasant after-effects except a very little vomiting.

In all these cases the patient was seated in a dentist's operating-chair, tipped back as far as possible, and the gas drawn from the apparatus of Johnston Bros. (1260 Broadway, New York) for the use of the liquid nitrous oxide. This has an inhaler fitted with a valve, so that atmospheric air can easily be admitted, and a cup-shaped cover to go over mouth and nose. Johnston Bros. make also a very convenient portable apparatus.

The patient in each case went quietly under the influence of the anæsthetic without any of the suffocating sensations caused by ether, and, with the exception of the vomiting in two of the cases, there were no unpleasant after-effects.

In some of the cases a blue and livid color of the face came on, as it will sometimes during the administration of ether; but this passed off at once on admission of air, and had no disagreeable consequences.

It was noticed that while this lividity of the face continued there was scarcely any bleeding from the dissection, and that the blood was very dark; but on admission of air the blood became bright at once and flowed freely.

Full muscular relaxation did not accompany anæsthesia in all these cases; but this was not an inconvenience, as it might prove in cataract and other operations.

The minimum and maximum quantities of gas consumed in these cases were seven and twenty gallons, at a maximum cost of one dollar.

Previous to the date of these cases my colleague, Dr. Rushmore, had employed nitrous oxide in a strabismus operation at the Brooklyn Eye and Ear Hospital, with very satisfactory results.

OPHTHALMIC CONTRIBUTIONS. By George Strawbridge, M.D., of Philadelphia.

I. TUMOR OF THE OPTIC NERVE—ITS REMOVAL WITHOUT ENUCLEATION OF THE EYEBALL.

The case occurred in a woman æt. 24, housekeeper by occupation, married. Both eyeballs were prominent from birth. For a number of years the woman had suffered from neuralgic attacks (right hemicrania) and slow loss of vision of right eye. Four years ago the eye became entirely blind. One year later, after a difficult confinement, a marked increase of exophthalmos of the right eye was observed. This has continued to time of operation.

Status præsens.—Right eyeball has an exophthalmos of 12 mm., and is pushed upward and toward the nasal side of the orbit by the tumor, which can be felt by the finger pressed between the inferior and external recti-muscular interspace. Motions of the eyeball are moderately good; tension not altered; some conjunctival injection; entire loss of vision.

Ophthalmoscopic Examination.—Refraction hypermetropic; media entirely clear; papilla, white, outline somewhat undefined, as if neuritis had previously existed

Diagnosis.—Atrophy of optic nerve after neuritis, caused probably by an optic nerve tumor.

Method of Operation.—The outer lid commissure was divided to increase the available room. The inferior and external recti-muscles were then divided at their eyeball attachment, and the interspace cleared sufficiently to allow a finger entrance. The tumor could be distinctly felt, and to a certain extent could be separated from the surrounding tissue by the finger; the optic nerve could be felt

passing into the growth, and the tumor projected far down the orbit. As the finger was laid on the growth, pulsation could be distinctly felt, and the eyeball, which rested on the finger, was seen to move synchronously with the arterial pulsation. A curved pair of scissors divided the optic nerve close behind the eyeball and in front of the tumor. The eyeball was turned upward and held resting on the supra-orbital ridge. This allowed closer examination of the mass below; pulsation could be distinctly noticed, and a wire ligature was placed around the lower end of the growth, and then with a needle a puncture was made to determine its character. The removal of growth was then completed with the scissors without considerable hemorrhage. An effort was made to preserve the eyeball, which still had four muscular attachments intact as well as considerable conjunctival and surrounding tissue.

At this stage of the operation the loose tissues of the orbit had become œdematous and were trimmed to some extent, to allow of replacement of the eyeball. This was finally accomplished and the lids closed by stitches to hold it in position, a pressure bandage being also used.

Twenty-four hours after the operation, cornea was slightly punctated. Day by day, the cornea became more cloudy, and ruptured on the tenth day, with escape of transparent vitreous and lens. The final result was an atrophied eyeball, which is still retained, and in which an artificial eye can be worn.

Examination of the tumor shows that the optic nerve, close behind the eyeball, is lost in a growth, having a long diameter of 38 mm. and a thickness of 20 mm. The tumor originally was of a soft consistence, and has been hardened by the Müller solution. The optic nerve is quickly lost after its entrance into the growth, which is surrounded by the nerve-sheath.

Microscopic Examination.—The outer layers consist of elongated, spindle-shaped cells, mingled with elastic fibres (the hypertrophied nerve-sheath). The central mass consists chiefly of short spindle cells with large, round cells in groups. The amount of granular matter is small. The tumor would be classified as a glioma.

Quite lately I have seen the patient. Her remaining eyeball is almost devoid of vision; optic papilla shows atrophy after neuritis; no increase in prominence of eyeball. Patient has cerebral symptoms indicating central lesion.

Goldzieher, in an excellent article on Tumors of the Optic Nerve (Graefe, Archive, 19th Year, 3d Part, 1873), has collected nine cases

of optic nerve tumor as the total reported up to that time; he summarizes these cases as follows:

"The growths are closely related to connective-tissue neoplasms. The greater number are fibroma, and have the peculiarity that the nerve fibres partly are distributed through the entire tumor and partly in a compact mass envelops it. The tumors have their origin in the inner nerve-sheath at some one point, and not in its entire extent. Thus it often happens that these tumors are excentric to the nerve in their position. A smaller number of these tumors belong to the class of sarcoma and glioma; in these cases the nerve is surrounded by the growth. The retina and papilla as yet have been so little examined that no conclusions can be drawn as regards changes taking place in them."

II.—CYST OF THE IRIS.

In the Philadelphia *Medical Times*, of February 15, 1873, I published an article on "Cysts of the Iris." At that time there was a total of thirty-four published cases; since then a number of others have been added to the list.

The case that I wish now to notice occurred in the right eye of a boy æt. 14. The cyst had a length of 7 mm. and a width of 6 mm., and projected far over into the pupil, leaving only a small slit open. In color it was opaque white, with brown fibres of iris tissue passing over it in streaks. A small cicatrix was seen at the lower corneal edge, as if resulting from a wound, although no such history existed. Some ciliary congestion around inner corneal margin.

The cyst occupied the nasal half of the iris, and was of one year's growth.

Tension of eyeball normal. No amount of pain had existed. V=$\frac{20}{100}$.

Operation for its Removal.—The cornea was punctured with a Graefe knife below the cyst; the knife was then withdrawn, and a pair of scissors completed the opening by a succession of cuts, gradually working around the growth, so as to extract it in its entirety. For this reason the Graefe knife had to be laid aside, as the counter-puncture could not be made without puncturing the tumor. About one-half of the cornea was divided: a wire loop was then introduced and the cyst extracted. The eyeball rapidly healed, and vision has increased to $\frac{20}{70}$.

Microscopic Examination.—The outer wall consists of the stroma and muscular coatings of the iris, the uvea being absent. This was

lined with a layer of squamous epithelial cells, swollen, and in an advanced stage of fatty degeneration. These cells are free from each other, and are surrounded by granular matter, fat, and cholesterine crystals. It might therefore be classed with certain sebaceous tumors, so-called, in which the common cystoid cell is wanting, and one that might be cited in proof of Paget's theory—that *they are sometimes a new formation.* Graefe also insists that in some instances the cyst must be regarded as a new formation, and supports his opinion by a case of dermoid cyst, which contained epidermis and hair, with amorphous fat and cholesterine.

III.—CONGENITAL MALFORMATION OF CONJUNCTIVA RESEMBLING PTERYGIUM EXTERNUM.

The case occurred in an infant æt. 6 weeks. The corneæ were covered to fully one-half their surface with a growth of conjunctiva extending from the outer lid commissure—a cloudy zone extended still further over the cornea—beyond the conjunctiva. The lid interspace was fully developed, no connecting bands existing between the growth and the palpebral conjunctiva. Outer canthi normal. Eyeball and appendages in other respects were normal, and child evidently had considerable sight. No cause can be assigned for this condition. Treatment delayed on account of age of patient.

THE RELATIONS OF BLEPHARITIS CILIARIS TO AMETROPIA. By D. B. St. John Roosa, M.D.

At the Fifth International Ophthalmological Congress, held in New York in 1876, I read a paper on the above subject, and stated the following conclusions, as those which seemed to me to be deduced from my cases :

" 1. Ametropia seems to be the condition of most eyes affected with blepharitis ciliaris.

2. When the blepharitis is associated with errors of refraction, the cure of the edge of the lids is very much facilitated by, and sometimes depends upon, correction of the ametropia.

3. Paralysis of the accommodation by the use of atropia will usually, with no other treatment, very much relieve the blepharitis that is associated with ametropia.

4. Patients suffering from blepharitis that is associated with ametropia will often ignore any other affection of the eyes than that of the edge of the lids, and deny that they suffer from asthenopia or conjunctivitis, complaining only of the discomfort and disfigurement produced by the disease ; and this when the error of refraction is so marked that we would naturally expect quite serious consequences from its non-correction.

5. The form of blepharitis to which my statistics refer is not a mere irritation of the edge of the lids, such as often accompanies a catarrhal conjunctivitis, but a true hyper-secretion of the tarsal glands and hair-follicles, with the formation of crusts, and sometimes the development of ulceration.

6. Hypermetropia is the error of refraction most frequently associated with blepharitis ciliaris.

I have here restated them, because one writer * has not, I think, kept them sufficiently in view in his paper intended as an answer to mine, on the relation of ametropia to blepharitis ciliaris. Since reading my own paper I have continued my investigations in this and a cognate subject, and I now beg the indulgence of the Society for a

* F. C. Hotz, Chicago Medical Journal and Examiner, April, 1878.

few additional statistics, as well as for a brief reply to some of the objections that have been made to my conclusions.

Two hundred and one cases of blepharitis ciliaris have been observed at the Manhattan Eye and Ear Hospital since the reading of my paper.

In spite of my efforts to secure an examination of the refractive state of the eyes thus affected, in only forty-eight of these was it noted. In these the refractive state is recorded as follows :

Hypermetropia	34
Myopia	1
Astigmatism	7
Emmetropia	6

Hypermetropia.

Case 1. (Under atropia), + $\frac{1}{30}$.
" 2. By ophthalmoscope.
" 3. + $\frac{1}{30}$.
" 4. Hypermetropia cum Presbyopia.
" 5. By ophthalmoscope, $\frac{1}{16}$.
" 6. " "
" 7. " " R.E., $\frac{1}{40}$; L.E., $\frac{1}{24}$.
" 8. (Under atropia), R.E., $\frac{1}{20}$; L., $\frac{1}{24}$.
" 9. " R.E., $\frac{1}{36}$; L.E., E.
" 10. Hypermetropia.
" 11. "
" 12. " $\frac{1}{40}$.
" 13. "
" 14. Atropia, R., $\frac{1}{24}$; L., $\frac{1}{30}$.
" 15. H., $\frac{1}{50}$.
" 16. Ophthalmoscope.
" 17. R., $\frac{1}{60}$; L., $\frac{1}{50}$.
" 18. Atropia, R.E., $\frac{1}{30}$; L., $\frac{1}{30}$.
" 19. Ophthalmoscope.
" 20. " $\frac{1}{20}$.
" 21. "
" 22. "
" 23. R.E. (E.); L., $\frac{1}{36}$.
" 24. $\frac{1}{24}$.
" 25. R., $\frac{1}{50}$; L., $\frac{1}{60}$.
" 26. $\frac{1}{40}$.

Case 27. Ophthalmoscope, R.E., $\frac{1}{14}$; L.E., $\frac{1}{16}$.
" 28. H. and strabismus.
" 29. Ophthalmoscope.
" 30. $\frac{1}{30}$; ophthalmoscope, $\frac{1}{16}$.
" 31. H., "
" 32. H., "
" 33. H.
" 34. $\frac{1}{20}$.

Myopia.

Case 1. V. R.E., $\frac{20}{50}$; L.E., $\frac{20}{30}$, with $-\frac{1}{12}$.

Astigmatism.

Case 1. R.E., $-\frac{1}{36} \supset -\frac{1}{48}$ axis 180°; L.E., $-\frac{1}{36} - \frac{1}{48}$, 180°.
" 2. R.E., $+\frac{1}{20}^{c}$, axis 90°; L.E., $+\frac{1}{18}$; A., 90°.
" 3. Astigmatism.
" 4. Mixed astigmatism.
" 5. R.E., $\frac{20}{40}$; L.E., $\frac{20}{40} - \frac{1}{12}^{c}$., 180°.
" 6. R.E., $+\frac{1}{12}^{c}$ axis 90 $\supset -\frac{1}{30}^{c}$; L.E., $\frac{20}{30} - \frac{1}{18}^{c}$., 15°.
" 7. R.E., $+\frac{1}{80}^{s} \supset +\frac{1}{14}^{c}$ 90°; L.E., V. $\frac{20}{30}$ E. (?).

Emmetropia.

Case 1. V. $= \frac{20}{40}$. (No reason given in register for amblyopia.)
" 2. E.
" 3. R.E., $\frac{20}{40}$; L.E., $\frac{20}{40}+$.
" 4. V. $= \frac{20}{30}$.
" 5. V. $= \frac{20}{20}$.
" 6. E. R. E. Left opacity of cornea.

Opacities of the Cornea.

There were eight cases of opacities of the cornea among those of which the refraction was not tested.

There was also one case of diminution of the acuteness of vision, with no assigned cause for the loss. R.E., $\frac{20}{40}+$; L.E., $\frac{20}{40}$. Not improved by glasses.

This increases the number of cases that may be said to have been examined to 57.

Even a superficial examination of these statistics shows that some of the statements made in my first paper are sustained by them.

There is even a larger proportion of refractive error among them than in the first series. This ametropia is also generally of such a degree as to require correction. That such a correction will in many cases assist in the cure of the blepharitis will hardly be denied. It is a step far beyond this, I admit to say that the blepharitis was caused by the strain from an uncorrected error of refraction. I am not sure, judging from my own experiences in another direction, but that we shall be obliged to modify our views as to how injurious is the strain of accommodation in hypermetropia; but I think that we may still believe that in many cases uncorrected hypermetropia will produce all the consequences of continued hyperæmia of the edges of the lids.

Since the publication of my paper I have seen 40 cases of blepharitis ciliaris in private practice, as follows:

CASE I.—Miss P., æt. 37. Is subject to styes; always has had asthenopia; now has blepharitis. R.E., $\frac{20}{30}$; H., $\frac{1}{48}$; V. $= \frac{20}{20}$. L.E., $\frac{20}{200}$. No improvement from glasses. Under atropia, H. R.E., $= \frac{1}{18}$; L.E., $+ \frac{1}{20} \supset \frac{1}{24}$ c 90°; V. $= \frac{20}{70}$. Glasses were prescribed, and two months after the patient writes that the glasses have given her "full satisfaction." There is no account as to the styes or blepharitis.

CASE II.—Æt. 17. About 11 months ago the patient observed that his distant vision was dim; has had asthenopia and blepharitis since then. M. $= \frac{1}{18}$; R.E., L.E., $- \frac{1}{30}$.

CASE III.—C. C., æt. 13. Has had blepharitis and asthenopia for about a year. V. $= \frac{20}{20}$. Under atropia, R.E., $+ \frac{1}{60}$ c 90° V. $= \frac{20}{16}$. L.E., $+ \frac{1}{60}$ c 90° V. $= \frac{20}{16}$. V. $\frac{20}{40}$ under atropia without glasses. Four months after the patient was using his eyes with comfort.

CASE IV.—F. G., æt. 28. Has asthenopia in the evening and blepharitis constantly. Under ophthalmoscope, eyes are H., rejects glasses. V. $= \frac{20}{20}$. Local treatment alone employed, and one month after the patient was better.

CASE V.—C. H. G., æt. 19. Has had blepharitis for 8 or 9 years, also asthenopia. V. $= \frac{20}{20}$. Under atropia, H. $= \frac{1}{42}$.

CASE VI.—Mrs. B., æt. 42. Has always suffered from asthenopia. Has blepharitis, and there is a chalazion on the right upper lid. H. $\frac{1}{48}$ and $\frac{1}{42}$. There is also marked insufficiency of the interni.

CASE VII.—P. T., æt. 20. The eyelids have been inflamed for two years; asthenopia in the evening; H. by opthalmoscope. Re-

jects all glasses for the right eye, accepts + $\frac{1}{12}$ for the left, under atropia + $\frac{1}{42}$. In a few days there was manifest H. of $\frac{1}{48}$.

CASE VIII.—A. C. B., æt. 25. Asthenopia, blepharitis in left eye for two weeks; under atropia H. = $\frac{1}{36}$.

CASE IX.—Mr. S., æt. 40. Has had red eyelids (edges) as long as he can remember. Sometimes, not often, has asthenopia. V. = $\frac{20}{20}$. Under atropia, R.E.H. = $\frac{1}{48}$; L.E.H. = $\frac{1}{42}$.

CASE X.—D. G. B., æt. 38. Has suffered from redness of the edges of the lids for the past five or six weeks. Has never had asthenopia. V. = $\frac{20}{20}$ − $\frac{20}{20}$, with − $\frac{1}{60}$. With ophthalmoscope eyes seem to be H. Ordered + $\frac{1}{48}$.

CASE XI.—Mr. C., æt. 31. Blepharitis ever since he can remember. No asthenopia. R.E., $\frac{20}{30}$ − L.E., $\frac{20}{30}$. Rejects glasses. Ophthalmoscope shows H. $\frac{1}{24}$ R.E.; L.E., $\frac{1}{48}$: Under atropia, R.E., + $\frac{1}{48}$ ⌒ $\frac{1}{48}^{c}$ 90° $\frac{20}{20}$; L.E., + $\frac{1}{48}$ ⌒ $\frac{1}{60}^{c}$ 90° $\frac{20}{20}$.

CASE XII.—Miss C. A. S., æt. 17. Asthenopia in the evening for a year. Red line along the edge of the lids for one year. V. = $\frac{20}{20}$. Under atropia, H. = $\frac{1}{36}$.

CASE XIII.—Dr. B. Has had blepharitis since he was seven years old. V. = $\frac{20}{20}$. Rejects glasses. H. as with opthalmoscope; atropia, R.E., + $\frac{1}{60}^{c}$ 80°. V. = $\frac{20}{20}$; L.E., + $\frac{1}{60}^{c}$ 90° $\frac{20}{20}$.

CASE XIV.—I. B., æt. 38. Asthenopia for the past four or five years. Has worn glasses, but latterly they have not afforded relief. Redness of the edge of the lids. R.E.H. $\frac{1}{48}$; L., $\frac{1}{36}$ − manifest.

CASE XV.—Miss H., æt. 18. Always has had asthenopia, and the eyelids get red. V. = $\frac{20}{20}$. Under atropia, R.E., $\frac{1}{42}$; L.E., $\frac{1}{48}$.

CASE XVI.—M. M., æt. 7. Eyes "weak" for a year. Slight blepharitis. V. = $\frac{20}{20}$. Advised atropia. No record of ophthalmoscope examination.

CASE XVII.—F. G. D., æt. 19. Asthenopia and slight blepharitis. V. = $\frac{20}{20}$. Under atropia, H. = $\frac{1}{48}$. Two months after, still has asthenopia and inflamed lids.

CASE XVIII.—Mrs. J., æt. 36. Has had asthenopia since she was eight or nine years old; blepharitis for a year. Under atropia, + $\frac{1}{30}$. Ordered glasses, and two months after writes that she uses them with perfect comfort.

CASE XIX.—Miss B., æt. 22. Redness of the edges of the lids as long as she can remember. V. = $\frac{20}{20}$ rejects glasses. Under atropia. R.E., H. $\frac{1}{30}$; L., $\frac{1}{36}$. Two months after, the patient was doing well.

CASE XX.—E. A., æt. 24. Has had sore eyes ever since birth. Has entropion and blepharitis. V. = $\frac{20}{40}$ + R.E.; L.E., $\frac{20}{50}$. Under

atropia, R.E., + $\frac{1}{30}$ᶜ 90° $\frac{20}{30}$, L.E., + $\frac{1}{20}$ᶜ 120° $\frac{20}{50}$. A year after has worn glasses, and eyelids are much better. An operation for entropion was performed, which relieved it, but the blepharitis remained, when the glasses were ordered.

CASE XXI.—Mrs. A., æt. 23. Eyelids have always been "diseased." Subject to styes. R.E., $\frac{20}{30}$ — L.E., $\frac{20}{20}$. Manifest H. = $\frac{1}{42}$.

CASE XXII.—Miss L., æt. 20. Blepharitis, phlyctenular keratitis. By ophthalmoscope, H. astigmatism. No improvement by glasses.

CASE XXIII.—L. W. D., æt. 14. Lachrymal catarrh, blepharitis. H. by ophthalmoscope.

CASE XXIV.—R. E., æt. 21. Inflammation of the edge of the lids ever since childhood; no asthenopia. R.E., central corneal opacities. L.E., H. = $\frac{1}{20}$.

CASE XXV.—S. J. F., æt. 21. Has been troubled with redness of the edges of the lids for four or five years. Asthenopia under atropia, R.E., + $\frac{1}{48}$ᶜ 60° — $\frac{20}{20}$; L.E., + $\frac{1}{48}$ 120° $\frac{20}{20}$.

CASE XXVI.—J. V. W., æt. 22. Eyes "weak" for several years. Lids have been red for several months. R.E., $\frac{20}{25}$; under atropia, L.E., $\frac{20}{20}$. R.E., H. $\frac{1}{36}$; L.E., + $\frac{1}{36}$ ⊃ $\frac{1}{48}$ᶜ 90°.

CASE XXVII.—F. G., æt. 22 (?). Blepharitis. Is wearing — $\frac{1}{18}$, selected by himself. V. = $\frac{20}{20}$ with — $\frac{1}{30}$. These were substituted for — $\frac{1}{18}$; three months after lids were much better.

CASE XXVIII.—S. O., æt. 20. Styes for four or five years. Has trachoma and blepharitis. V. = $\frac{20}{20}$. Rejects glasses. Under atropia, H. = $\frac{1}{36}$; V. = $\frac{20}{20}$.

CASE XXIX.—H. D. N., æt. 21. Weak eyes since he was three years old. Blepharitis; accepts + $\frac{1}{36}$. Under atropia, R.E., $\frac{1}{18}$; L.E., + $\frac{1}{24}$. The treatment was of benefit in this case, as stated by patient five months after.

CASE XXX.—B. A. C., æt. 22. Asthenopia, trachoma, and blepharitis. H.M., $\frac{1}{42}$. Declines glasses. Five months after, blepharitis no better.

CASE XXXI.—F. B., æt. 20. For two years has had blepharitis, and has been unable to read at night. R.E., E.; L.E., mixed astigmatism.

CASE XXXII.—E. B., æt. 14. Has had blepharitis for eighteen months, asthenopia for a year. H.m. = $\frac{1}{36}$.

CASE XXXIII.—Jennie Y., æt. 11. Has always had blepharitis. V. = $\frac{20}{20}$ — H.m. $\frac{1}{48}$, and V. = $\frac{20}{20}$.

CASE XXXIV.—Mrs. F. B., æt. 27. Blepharitis for six months. R.E., $\frac{20}{50}$; L.E., $\frac{20}{20}$. Under atropia, R.E., + $\frac{1}{48}$ ⊃ $\frac{1}{30}$ᶜ $\frac{20}{20}$; L.E., $\frac{1}{30}$.

CASE XXXV.—Mrs. A. B. De, æt. 29. Blepharitis and asthenopia for four or five years. Has used local applications without benefit, under advice of an oculist. V., $\frac{20}{20}$. Rejects all glasses. Under atropia, + $\frac{1}{36}$c ; axis, 90°, each eye.

After use of glasses patient is now, six months after, quite well as to lids ; has occasional attacks of asthenopia. The use of atropia did great good to the lids without glasses.

CASE XXXVI.—Mrs. A. E., æt. 41. Has had blepharitis and asthenopia for twenty-five years.

Oph. shows H. ; advised + $\frac{1}{36}$, and patient, who is often seen, states that her eyes are well.

CASE XXXVII.—Miss M. O. R., æt. 21. Has always had blepharitis. Under atropia, H.R.E., + $\frac{1}{48}$; L.E., + $\frac{1}{48}$c 180°.

CASE XXXVIII.—C. L. W., æt. 11. Blepharitis for one year. Atropia, R.E., $\frac{1}{48}$; L., $\frac{1}{42}$. The patient did well under use of glasses.

CASE XXXIX.—R. D. M., æt. 19. Pain in eyes ; blepharitis for several years. Under atropia, R.E., — 60c 180° $\frac{20}{20}$; $\frac{20}{50}$ without glasses. L.E., + $\frac{1}{60}$c 180° ; $\frac{20}{30}$ without glasses.

CASE XL.—Henrietta L. Has blepharitis ; has been wearing glasses for some time in the evening. Under atropia, R.E., + $\frac{1}{4}$ ⌒ + $\frac{1}{42}$c 90° $\frac{20}{20}$; L.E., + $\frac{1}{44}$ ⌒ + $\frac{1}{36}$ 90°.

CASE XLI.—J. M. C., æt. 22. Blepharitis for ten years ; photophobia ; no asthenopia ; trachoma. V. = $\frac{20}{40}$ — 35. R.E., — $\frac{1}{60}$ ⌒ — $\frac{1}{60}$c 90° $\frac{20}{20}$; L.E., — $\frac{1}{60}$ ⌒ — $\frac{1}{60}$c 90 $\frac{20}{20}$.

CASE XLII.—Miss P., æt. 14. Blepharitis and asthenopia. V. $\frac{20}{30}$ — R.E. ; L.E., $\frac{20}{40}$; atropia, R.E., + $\frac{1}{30}$; V. = $\frac{20}{20}$. Patient did well.

CASE XLIII.—Mrs. E., æt. 32. Asthenopia always ; blepharitis. Atropia, R.E., — $\frac{1}{60}$c, axis 90° ; L.E., E.

CASE XLIV.—Bella P. Blepharitis ; hyperopia, $\frac{1}{60}$.

CASE XLV.—M. N., æt. 7. Asthenopia and blepharitis. H. by ophthalmoscope, $\frac{1}{48}$.

CASE XLVI.—Mrs. C. B., æt. 43. Asthenopia ; blepharitis. H. = $\frac{1}{36}$.

CASE XLVII.—J. W., æt. 9. Asthenopia ; slight blepharitis ; refraction could not be determined.

Summary.—Total number of cases seen in private practice :

Hypermetropia.—Refraction the same in eye. Degree—$\frac{1}{36}$, $\frac{1}{48}$, $\frac{1}{60}$, $\frac{1}{30}$, $\frac{1}{48}$, $\frac{1}{36}$, $\frac{1}{48}$, $\frac{1}{42}$, $\frac{1}{36}$, $\frac{1}{42}$, $\frac{1}{30}$, $\frac{1}{48}$, $\frac{1}{42}$, $\frac{1}{36}$, $\frac{1}{48}$, $\frac{1}{36}$, $\frac{1}{42}$, $\frac{1}{42}$.

When the eyes were of different refraction—R.E. $\frac{1}{48}$, L.E. $\frac{1}{42}$; R.E. $\frac{1}{30}$, L.E. $\frac{1}{36}$; R.E. $\frac{1}{48}$, L.E. $\frac{1}{36}$; R.E. $\frac{1}{24}$, L. $\frac{1}{48}$; R.E. $\frac{1}{48}$, L. $\frac{1}{42}$; R.E. $\frac{1}{48}$, L.E. $\frac{1}{42}$.

Degree undetermined—1.

Total number of cases of H.—25.

Hypermetropic astigmatism.—The same in both eyes, $\frac{1}{60}$, 180°, $\frac{1}{36}$, axis 90°; R.E., $\frac{1}{48}$, a. 60°; L.E., $\frac{1}{48}$, a. 120°; R.E., $\frac{1}{60}$, a. 90°; L.E., $\frac{1}{60}$, a. 90° $\frac{1}{60}$, a. 90°—5.

Of different degrees—R.E., $\frac{1}{60}$; L.E., E.; R.E., $\frac{1}{4}$ ⊃ $\frac{1}{42}$ᶜ 90°; L.E., $\frac{1}{42}$ ⊃ $\frac{1}{36}$ 90°; R.E., $\frac{1}{48}$ ⊃ $\frac{1}{30}$ᶜ; L.E., $\frac{1}{36}$ H.; R.E., $\frac{1}{36}$; L.E., $\frac{1}{36}$ ⊃ $\frac{1}{48}$ᶜ; R.E., $\frac{1}{48}$, axis 60°; L.E., $\frac{1}{48}$ᶜ, axis 120°; R.E., $\frac{1}{30}$ 90°; L.E., $\frac{1}{20}$ᶜ 120°; R.E., $\frac{1}{60}$ 80°; L.E., $\frac{1}{66}$ 90°; R.E., $\frac{1}{48}$ ⊃ $\frac{1}{48}$ᶜ 90°; L.E., $\frac{1}{48}$ ⊃ $\frac{1}{60}$ᶜ; R.E., $\frac{1}{18}$; L., $\frac{1}{20}$ ⊃ $\frac{1}{24}$ᶜ 90°—9.

Degree undetermined, 1. Total, 15.

Myopic astigmatism.—$\frac{1}{60}$ − $\frac{1}{60}$ᶜ 90°—1.

Myopia.—$\frac{1}{30}$; R.E., $\frac{1}{18}$; L., $\frac{1}{30}$—2.

Mixed astigmatism.—R.E., E.; L., mixed astigmatism—1.

Refraction not determined—2.

These statistics are certainly very different from those given by Dr. A. Alt,* who examined forty-eight cases of blepharitis with a view to test the connection between ametropia and inflammation of the lids. According to Dr. Alt, "thirty-nine of them had emmetropia, five myopia, three hyperopia, one astigmatism." I know of no way of reconciling Dr. Alt's statistics with my own, since there is no record of the manner in which the refraction was estimated, or of what Dr. A. considers an emmetropic eye. I do not regard any eye as emmetropic, which, not having V. $\frac{20}{20}$, obtains it under the influence of atropia with a convex glass of $\frac{1}{60}$ or upwards; neither do I regard the test by the ophthalmoscope as sufficient to determine the existence of latent hypermetropia.

Dr. F. C. Hotz † examined eighteen cases in private practice, "of which five, or thirty-three per cent., showed ametropia (four showed hypermetropia, one myopia, and one astigmatism (6?)). Dr. H. did did not use atropia for the determination of the refraction in his cases; and he concedes that, had he employed it, some of his cases might have shown a slight degree of hypermetropia. Dr. Hotz is, however, of the opinion that, however great may be the proportion of

* Archives of Ophthalmology and Otology, Vol. VI., p. 180.

† Chicago Medical Journal, April, 1878.

ametropia, there is no etiological connection with this and blepharitis. Dr. H. is mistaken, I think, in his statement that Dr. Erisman examined his cases under atropia. The mistake is all the worse because a correct account of Erisman's statistics rather makes for Hotz's views than against them. Erisman * states that under atropia it is probable that there would be a larger percentage of H. than he found and that the hyperopic eye is probably the normal one in youth.

Dr. Hotz assumes that no strain on the accommodation occurs in myopic eyes unless they are armed with unsuitable glasses. I believe that not only those that have improper glasses, but also those myopes that wear no glasses at all, suffer from strain.

Dr. Hotz's argument against the occurrence of blepharitis without asthenopia may be answered by my own experience and that of my associate in practice, Dr. E. T. Ely, as follows: We have seen many cases of blepharitis without noticeable asthenopia. Some of these were cured for the time by a simple paralysis of the accommodation by means of atropia, and many are the cases that have been treated for years without apparent benefit, which were entirely relieved of their unsightliness and discomfort after glasses were worn in conjunction with a simple local treatment.

There is no probable way of accounting for the cure in these cases, except by a reference to a correction of the error of refraction. In saying this, I am very far from asserting that every case of blepharitis is caused by an error of refraction.

I cannot agree with those who have objected to my views, who argue that slight degrees of H. seldom give rise to asthenopia. My experience is just the other way. Of course, I consider a $\frac{1}{4}_{2}$ a low degree; perhaps a $\frac{1}{2}_{4}$ is the first point at which H. may be said to be at all of a high degree; certainly there is often great relief from the correction of a $\frac{1}{4}_{8}$, or even a $\frac{1}{6}_{0}$, when that sixtieth is in one meridian only, while the other is emmetropic.

Donders regards the degrees of H. from $\frac{1}{1}_{0}_{0}$ to $\frac{1}{4}_{0}$ as not to be observed in youth. Under ordinary circumstances I grant this, but in some cases I am inclined to the view that $\frac{1}{4}_{8}$ may need correction after ten years of age, or least for a time.

In others, as I have shown in another paper, a $\frac{1}{2}_{4}$ may exist even in the eyes of a student, and never cause any inconvenience of any kind. When all the factors are at work that produce asthenopia, blepharitis, and so forth, even a very slight error of refraction

* Graefe's Archiv, B. 17, A. I.

will materially assist in making the patient uncomfortable, and its correction will do great good.

Dr. Hotz is of the opinion that blepharitis occurs chiefly in children. I am not sure that this is a fact; certainly those cases observed by me in private practice were chiefly among adults. Of two hundred and one cases seen at the Manhattan Eye and Ear Hospital, a little more than fifty per cent. occurred in persons under fifteen; but of very young children, that is, of five years of age or under, there was only twenty-eight per cent., whereas Dr. H. states that he has observed the greatest number among these. Dr. H. asks if I omitted young children from my statistics, because I could not employ the tests of vision. I answer that I have inserted in my statistics every case that has presented itself to me. Because children do not read and write, it cannot be argued, however, that they do not use the ciliary muscle and interni. Any one who has watched a child at play, for instance, picking up small objects for a number of minutes at a time, will soon be convinced that they are often using a great deal of accommodative power, in their effort for exact vision, before they learn to read and write.

If Dr. Alt and Dr. Hotz will examine their cases under atropia, I am sure they will form different conclusions, as to the existence of ametropia in connection with blepharitis ciliaris, from those that they have expressed. I still believe that there is much more than mere coincidence in the frequent occurrence of blepharitis in connection with strain on the accommodation from refractive defects and opacities of the cornea, and that correction of the error will do as much towards the relief of the hyperæmia and inflammation of the lids as the correction of hypermetropia does for asthenopia. I suspect, however, that since Donders' exposition of asthenopia we have all overrated the curative power of glasses, and that some writers have been led greatly into error in ascribing nervous affections too exclusively to the influence of an uncorrected error of refraction. Certain it is, as I have before indicated, that there are many cases where quite a high degree of uncorrected hypermetropia does no harm to the subject of it.

LACHRYMAL CONJUNCTIVITIS AND SOME OF THE OTHER INJURIOUS EFFECTS OF RETENTION OF THE TEARS. By J. S. Prout, M.D., of Brooklyn, N. Y.

The retention of the tears in contact with the tissues of the eye causes disease of the conjunctiva, cornea, and lids, and aggravates and indefinitely prolongs existing diseases of those parts, although these diseases themselves may have caused the stillicidium. Thus cause and consequence exchange places, but the conjunctivitis, keratitis, or blepharitis *cannot be cured* while the stillicidium persists.

A strange outgrowth of the theory of the older authors, that inflammation of the tear-passages depends upon a specific quality of the lachrymal secretion, appears in the motto which Martini in 1843 prefixed to his work *On the Influence of the Tears on the Human Eye*: Des Auges tödtlichster Feind ist die Thränenflüssigkeit (the deadliest enemy of the human eye is the lachrymal secretion): (*Schirmer, Graefe-Saemisch Handbuch*, vii. 1, p. 33). More moderately and more correctly Mackenzie says: "The tears are at all times an irritating secretion. The conjunctiva is instantly reddened when they flow; and although we were to grant that this was consentaneous with determination of blood to the lachrymal gland, preceding the discharge, yet we observe that if the tears are so profuse as to run over the cheek, the skin with which they come into frequent contact becomes inflamed and excoriated." (*Dis. of the Eye*, Phila., 1855, p. 149.)

Saemisch says that the hyperæmia of the conjunctiva which is caused by blepharitis or disturbances of the tear-conducting apparatus, yields spontaneously as soon as these pathological conditions are removed. (*Graefe-Saemisch Handbuch*, iv. 1, 9.) He also speaks of a "*circulus vitiosus*," the members of which are: catarrh of the conjunctiva, blepharitis angularis, dermatitis angularis, eversion of the lower lachrymal puncta, epiphora, lodgment of fluids in the conjunctival sac, *catarrh of the conjunctiva*. From these follow blepharitis ulcerosa, ectropium, keratitis. (p. 14.)

The stillicidium that is caused by eversion of the lower punctum causes irritation of the skin of the lids, loss of tissue, and shrinking. (p. 62.)

Schirmer speaks of "conjunctivitis lacrymalis *nach* Galezowski," the conjunctiva bulbi, plica semilunaris and caruncula lacrymalis being inflamed, either from inflammation extending from the tear-passages, or through the special irritation caused by the mucus which escapes from the puncta, or by the simple retention of the tears. A further result of the constant wetting of the edges of the lids by the tears is the almost unending blepharitis ciliaris. The epiphora becomes permanent and dacryocystitis and blepharitis stand in an evil relation to the overflow of the tears. (*Graefe-Saemisch Handbuch*, vii. 1, p. 23.) He expresses the opinion that the conjunctivitis and blepharitis that occur in the course of dacryocystitis are only the results of the presence of the tears, and of the mucus which escapes from the sac by the puncta. (p. 32.)

Schweigger speaks of chronic conjunctivitis and blepharitis as secondary inflammatory processes caused by strictures of the nasal duct. (*Handbook of Ophthalmology*. Translated by Farley. Phila., 1878, p. 214.) Severe inflammation of the edges of the lids may occur as a consequence of other diseases which have caused long-continued hyperæmia of the conjunctiva and abnormal retention of the lachrymal secretions. (p. 218.) He also speaks of a "vicious circle." "Especially is the tear-passage to be kept open, since a perpetual dripping of the tears has a most hurtful influence." (p. 220.) "Among the local causes which induce or maintain conjunctivitis are strictures of the nasal duct," &c. (p. 255.)

Wells, in speaking of stillicidium lacrymarum and its results, says that if the true nature of this irritability of the eye and of the lachrymation is overlooked, very obstinate and intractable inflammation of the edges of the lids and of the conjunctiva may ensue, which sets defiance to every form of collyrium or topical application. but readily yields if the impediment in the lachrymal apparatus is removed, and the stillicidium cured. The obstruction to the efflux of the tears may be situated at any point of the lachrymal canal, in the puncta, the canaliculi, the sac, or the nasal duct. (*Diseases of the Eye*, 2d ed., 1870, p. 653.)

The first special paper on this subject is by Galezowski (*Mal. des Yeux*, Paris, 1872, p. 157), to whom we are indebted for the term "Lachrymal Conjunctivitis." (See also *Gaz. des Hôpitaux*, 1868, p. 430, and Fitzgerald, *Dublin Jour. Med. Science*, Nov., 1869, p. 675.) I have not time to reproduce this paper here, though it well deserves our fullest consideration.

Notwithstanding the references to the pernicious effects of the tears

upon the conjunctiva, &c., which I have been thus able to make, the importance of these effects and their recognition and proper treatment receive less attention than should be given to them. In Vienna, at the clinic of Prof. Stellwag, I saw this matter neglected; and in his great work on the Eye, 4th Am. Ed., 1873, under Catarrhal Conjunctivitis, p. 373, the effect upon the conjunctiva of the constant presence and running over of the tears seems inadequately referred to. In the chapter on Trachoma, p. 410, we are told that eversion of the lower lid, which often occurs, "by continuous dropping of the tears, leads to erythematous inflammations and excoriations of the lids and cheeks, and subsequently to their shrinkage; and thus the improper position of the lid is increased and at the same time the inflammation in the conjunctiva and cartilage maintained, and further degeneration favored." This reference is enough, when carefully sought for and freely interpreted, to prevent the case from going by default; and so perhaps is the clause under the head of Treatment, p. 410, calling for the "removal or keeping away of all injurious influences which may possibly increase or maintain the process." On p. 501, "Blennorrhœa of the Lachrymal Passages," we are told that "the frequent combination of dacryocystoblennorrhœa with catarrhal conjunctivitis and blepharitis ciliaris is worthy of mention. These are often secondary, from the contact of the products from the lachrymal passages with the conjunctiva, and the opportunity for the excessive formation of crusts on the edges of the lids."

Prof. Arlt, in his chapters on operations (Graefe-Saemisch Handbuch, B. III.) describes Bowman's method of slitting the canaliculi, giving certain indications for its performance, but says no word to indicate that the relief of conjunctivitis or blepharitis is among these indications.*

In Zurich I saw the connection between stillicidium and chronic conjunctivitis disregarded.

At Moorfields Ophthalmic Hospital, London, a case of chronic conjunctivitis with everted puncta and wet, soaked, irritated edges of the lids, presented himself to one of the attending surgeons—a man

* May not this be considered the great defect of this noble work? *Each* author should have given the operative as well as the medical treatment of the pathological conditions he described. Another defect almost equally great, in another direction, is that there is no index either for each special subject or for the whole work.

of world-wide reputation outside of ophthalmology—who said, in reply to a question, that the everted puncta and the stillicidium were caused by the conjunctivitis, and had nothing to do with keeping it up. He forgot the vicious circle, for it would be the height of presumption to say that he did not apprehend it.

As the retention of the tears in contact with the conjunctiva, &c., is the cause of the trouble under consideration, the diagnosis resolves itself into determining whether the tears are or are not carried off sufficiently freely or at all, and whether, in any given case where the tears remain temporarily in contact with the tissues, they are exciting a prejudicial action. The diagnosis of stillicidium is sufficiently well understood to require no special elucidation here—time and space are too limited. In many cases the wet edges of the lids at once attract the surgeon's notice ; often, however, this condition is so slight that one may feel doubt as to the existence of stillicidium. Weils calls attention to the important fact that the punctum may be at the apex of a nipple-like prominence, so that the entrance of the tears is rendered difficult. (Op. cit., p. 654.)

In considering the matter of treatment, it is well to bear in mind the dictum of Schirmer, that "wounds of the posterior wall of the canaliculus, whilst the other parts are undisturbed, have not the slightest evil results, as is shown by the daily performance of the operation for slitting them." (Op. cit., p. 23.) Therefore, when, as sometimes happens, there is doubt as to the actual condition, it is well to give the patient the benefit of a carefully performed operation. At the same time it is not to be forgotten that the obstruction may be of a temporary character and may yield to the usual treatment of conjunctivitis. The writer recalls a case of dacryocystitis, in a child, that yielded readily to a weak alum solution as a collyrium. But in the very large proportion of cases the observant practitioner will at once perceive the necessity for an operation.

It is not the purpose of this paper to discuss cases that require the use of the sound to dilate strictures of the nasal duct. These are not likely to be overlooked. Nor do I wish to consider the treatment of strictures of the canaliculi, but only faults of the puncta. For this the full slit as made by Bowman is not necessary. It is only needful to obtain an *enlarged* punctum in a more favorable position. To do this when there is no or but slight displacement of the punctum (the inferior is now under consideration, as it is seldom necessary to interfere with the upper) the edge of the lid is put on the stretch, as for Bowman's operation, one of the points of a delicate

pair of scissors is introduced into the canaliculus at right angles to the edge of the lid, carried as far in this direction as possible, and the tissue between the blades divided by one quick stroke. In the depth of the wound the beginning of the horizontal part of the canaliculus can be seen. The fluid in the lacus lacrymalis now lies in contact with the slit thus made, and if the canaliculis is pervious the tears are carried into the sac. This is a modification of Bowman's operation as done with the scissors, and might well receive the name *Bowman minor.*

The tendency of the edges of the incision to unite is not greater than in the ordinary operation when done as a preliminary to the use of the sound. The usual result is an enlargement of the punctum *towards* the reflected portion of the conjunctiva of half a line to a line.

When there is much eversion of the punctum or tumefaction of the conjunctiva, the operation is the same, with the addition of the removal of a piece of the conjunctiva somewhat as proposed by Mr. Critchett in his Lectures on the Diseases of the Lachrymal Apparatus, *Lancet*, 1863, Vol. II., p. 697; (referred to by Wells, op. cit., p. 657), as follows: "Occasionally, however, I have found that the eversion is so considerable, owing to the thickness and swollen condition of the lower lid and its inner lining, that even the canal when laid open remains everted and the tears do not reach it, but still flow over. Under these circumstances I have been in the habit of seizing a portion of the posterior wall of the canal and snipping it out with scissors, thus effecting the treble objects of drawing the canal more inward toward the caruncle, of forming a reservoir into which the tears may run, and of preventing any union of the parts." When the fault is in the punctum and not in the canaliculus, the complete slitting of the latter is not necessary. The modification proposed by Mr. Critchett shares the same condemnation; but a modification of the latter, called, for brevity, at the Brooklyn Eye and Ear Hospital (where it has been long in use, author's name not known), *Critchett minor*, is believed to fill, in a very large proportion of cases, all the indications required. It consists of the operation called Bowman minor, with the addition that by means of a fine-toothed forceps the conjunctiva at the *end* of the perpendicular incision is seized and a circular or triangular piece is cut out with scissors from the inner surface of the lid towards the cul-de-sac. This piece may vary from one line to three or four lines in diameter. Thus we obtain the treble results (in Mr. Critchett's words) "of

drawing the canal" (the new and enlarged punctum rather) "more inward toward the caruncle, of forming a reservoir into which the tears may run, and of preventing any union of the parts." * In addition, it is a good operation for the cure of eversion. The writer has seen quite decided correction of the position of the margin of the lid thus obtained.

This is, in the strictest sense of the word, an extemporaneous operation, can be done with four cuts of the scissors, and requires no anæsthetic in the writer's practice. He is in the habit of doing it in the consulting-room without making any preliminary explanation to the patient, who is, as it were, taken by surprise, and whose resistance is *anticipated, not invited.*

In Jones' *Ophthalmic Medicine and Surgery*, Am. Edition, Phil., 1863, p. 399, the editor mentions an operation "recently proposed" by Mr. Haynes Walton, for the relief of eversion of the punctum when caused by a slight ectropium: "With a very small scalpel and a fine cross-tooth pair of forceps, a bit of the conjunctiva just posterior to the canaliculus, and from over the entire thickness (?) of the cartilage, is dissected off. The wound is left to cicatrize, and the manner in which the punctum is righted is surprising.—Ed."

For more than six years the diagnosis "Lachrymal conjunctivitis (Galezowski)" has been made at the Brooklyn Eye and Ear Hospital.

The following illustrative cases—two from private, the others from hospital practice—are appended:

CASE I.—The Rev. D. R. B., in good general condition, consulted me on Dec. 13, 1870. He had long been troubled by weakness of his eyes, for which during the preceding year he had consulted Dr. Liebreich in Paris, who prescribed glasses for astigmatism and gave him a lotion and an ointment; but there was no improvement. I found the lids swollen, with incrustations along the edges, and swelling—papillary engorgement—of the palpebral, slight injection of the ocular conjunctiva. The inferior lachrymal punctum of the left eye was somewhat everted, in consequence of the swollen condition of the conjunctiva, causing stillicidium, though the punctum and canaliculus were open. In order to allow the tears to pass off by the natural channel, I enlarged the punctum downward and removed a small triangle of conjunctiva from the inner surface of the lid (Critchett minor), then

* See remarks on this subject by Mr. J. F. Streatfield, in the Royal Ophthalmic Hosp. Reports, Vol. I., p. 103.

applied argent nit. mit. to the conjunctiva, and prescribed a chloride of zinc wash and diluted citrine ointment. He returned in four days, reporting his condition very much improved ; could use his eyes much more freely than before. Two weeks later he was not so well—the stillicidium had returned in consequence of the closure of the small opening made ; the piece removed had not been large enough. The operation was therefore repeated and a larger piece of conjunctiva removed. Arg. nit. mit. lightly applied.

He returned Feb. 11, 1871, reporting the left eye better than it had been for a long time. As the right eye was affected in a similar manner, though in a less degree, I also removed a triangular piece of conjunctiva from the lower lid. The use of the wash and ointment was continued.

The result was entire relief for years of the inflammation of the eyelids ; he was able to use his eyes with ease. In Feb., 1877, during my absence, he consulted Dr. A. Mathewson, whose memorandum, kindly furnished me, states that his lids trouble him at intervals after use.

CASE II.—W. A. K., aged about eight years, consulted me in 1876 for conjunctival disease, for which he had been treated unsuccessfully by a New York City oculist. My notes state that the conjunctiva of the lids was roughened, though not fairly granular, and that there were some phlyctenula-like vascularities near the cornea. (See Galezowski, op. cit., p. 158). Atropine solution was instilled, a borax and camphor wash and a camphor ointment (camphor ice), prescribed. Under this treatment he improved. May 18th of this year he came to me again. There was stillicidium, the inferior puncta being slightly everted ; the palpebral conjunctiva was injected and thickened from papillary engorgement ; there were the same phlyctenula-like vascularities that were before noted ; each cornea was clear. I considered the case one of lachrymal conjunctivitis, in which, the cause continuing to act, the treatment adopted had only been followed by temporary relief. The puncta and canaliculi were therefore slit, the latter for about one line only (Bowman minor). No applications were made ; a wash containing borax and tannin was prescribed ; the openings made closed, so that it was necessary to repeat them, after which decided improvement resulted, which was increased by a slight use of blue-stone.

CASE III.—Mary H., aged 30. Brooklyn Eye and Ear Hospital, 16752, 1878. Lachrymal conjunctivitis. Her eyes have been sore for twelve years ; have had treatment at different times ; they are

now often very sensitive to light, the edges of the lids are reddened and sodden-looking at outer and inner angles, conjunctival surfaces of lids look as if they had been granular but now are quite smooth, corneæ very slightly nebulous. The slightly everted puncta failed entirely to carry away the tears, and as a consequence the inflammation persisted. The inferior puncta were cut and pieces of conjunctiva removed from the inner surfaces of the lower lids (Critchett minor), so as to secure free carrying off of the tears. Marked improvement followed.

CASE IV.—F. (Case 7853, Brooklyn E. and E. Hospital) had been operated on by Graefe's method for cataract, O. S. Feb., O. D. April, 1878. On July 2d, finding that there was much annoyance from stillicidium, O. D., causing conjunctival irritation, I did a Critchett minor, which was followed by much improvement, and this still continues. The lids were dry the next day.

CASE V.—J. L., aged 45, March 28, 1872 (Case 5191, E. and E. Hospital). Lachrymal conjunctivitis. His eyes have watered for years. Bowman's operation was done on each lower lid and an alum wash given. Three months later he said that his eyes were more comfortable than they had been for years. The tears ran down through the ducts.

CASE VI.—E. and E. Hospital, 9677, Jan'y 16, 1875. Lachrymal conjunctivitis, caused by everted puncta. Critchett minor was done, removing pieces of conjunctiva from lower lids, and a sulphate of zinc wash given. Fifteen days later there was much improvement visible.

CASE VII.—E. and E. Hospital, 16385, April 2, 1878. There is eversion of the inferior puncta from blepharitis, which is kept up by the continual soaking of the tears. Critchett minor on both sides was performed, a ten gr. sol. arg. nit. applied, and a borax wash given for frequent use. April 27.—The eyes are dry, the tears pass down by the natural channels. The use of the sol. arg. nit. was continued after the operation.

CASE VIII.—E. and E. Hospital, 16554, April 23, 1878. Trachoma both eyes. O. D. has a central ulcer of the cornea. The edges of lids are constantly bathed in the lachrymal secretion, which cannot be carried away on account of the faulty position of the inferior puncta. This aggravates all the other symptoms. To relieve it did Critchett's operation on both lower lids, and gave a sulphate of zinc wash; April 25th, improvement marked; tears go down by ducts; ten gr. sol. arg. nit. July 20.—O. D., ulcer perforated some

days ago ; patient attended irregularly ; O. S. granulations much improved. Both eyes are dry, the tears passing down by the nasal ducts.

It may not be out of place in conclusion to say a few words on what appears to the writer the best method of performing Bowman's operation. The most recent English work on the diseases of the eye, by Mr. Carter, appeared in 1875. He gives the following description (p. 221) : "The surgeon carries the knife horizontally along the canaliculus, *cutting edge upwards* (italics mine), the knife is raised from the horizontal to the perpendicular position, and it divides the whole length of the canaliculus during the movement."

In Mr. Wells' work on the eye we find the statement that the knife should be run "with its *sharp edge upwards* (italics mine), along and quite up to the extremity of the canaliculus, and the latter be divided along its whole course by lifting the knife somewhat from heel to point." (2d Ed., 1870, p. 655).

I am not able to refer to Mr. Bowman's own description of his operation, but it may fairly be supposed that Mr. Wells, one of the surgeons of the hospital in which Mr. Bowman has done so much and so excellent work, gives a correct description of the operation. On the other hand, Prof. Arlt says that the cutting edge of the knife or scissors must be so directed that the wound shall gape up or down and *backwards*. (Graefe-Saemisch Handbuch, iii. 480.)

Wecker says the edge of the knife should always be directed *towards the globe of the eye* (italics mine) so that the artificial opening may present in the same direction. (Mal. des Yeux, 2d Ed., 1867, T. i., p. 867).

The writer has been led by observation, and not by either of these authorities, to adopt the following method of operation on the inferior canaliculus : The lid is drawn downward and outward as fully as possible, the probe-point of the knife is then introduced perpendicularly into the punctum with *the cutting edge of the knife turned towards the ball ;* when the knife takes the horizontal position the edge is turned *still more towards the inferior cul-de-sac*, and in this position is pushed along the canal as far as desired, and is then made to cut out by moving the handle in an inward slightly upward direction. The result is a curved incision, the convexity of which is directed downward, which presents its canal to the lacus lacrymalis. The advantages of the method are that the tears are well carrried off, the wound is well hidden behind the margin of the lid, it serves well for probing, and

has, perhaps in consequence of the free movement of one lip upon the other, less tendency to unite than the ordinary incision made with the "sharp edge upwards." Except that it has no power to correct an eversion, however slight, it has the advantages claimed by Mr. Critchett for his modification of Mr. Bowman's operation.

The writer is aware that this paper contains very little that may not be found already in print, but still he feels that the subject is of so great importance that there is no need to apologize for its presentation.

EXTIRPATION OF THE OSSIFIED CHOROID WITHOUT ENUCLEATION OF THE EYEBALL. By Dr. Henry W. Williams, Boston.

On the 7th of December, 1877, I saw Mary D., aged 21. She stated that her right eye was lost from scarlatina at two years of age. Her eyeball was slightly smaller than the other, the cornea and iris of unhealthy aspect, and the lens yellowish and shrunken, with adhesion of the disorganized iris to its surface. There was no marked injection of the vessels, but the globe was slightly tender on pressure, and, she said, was at times painful.

The deformity was considerable; and as, furthermore, sympathetic ophthalmia was to be apprehended, I advised the removal of the anterior part of the eye, including the ciliary region and the crystalline lens, informing the patient that she would thus have an excellent stump for the support of an artificial eye.

The patient was etherized, and an incision made as proposed, by transfixing the eyeball. But, unexpectedly, the knife encountered hard material in the parietes of the globe, and on examination after removal of the anterior portion it was found that the choroid had undergone osseous transformation.

As previous to etherization I had given the patient to understand that the eye was not to be enucleated, I determined to remove the osseous shell and leave the sclera. Only a thin serous fluid occupied the vitreous space. The wound was brought together with five fine sutures. No suppuration or inflammation followed. At the end of ten days the sutures were removed, and the patient had fully recovered in two weeks, with a linear cicatrix, and with much less shrinking of

the sclera than was expected. This good condition remained some months after.

The excellent results of this novel procedure, and the similar good conditions obtained by the scooping out of the contents of the globe, without removal of the sclera, in cases of ophthalmitis, would indicate that removal of the anterior portion of the eye might often be substituted for enucleation in cases where an operation is indicated to avert the danger of sympathetic inflammation, and that such removal, with evacuation of the contents of the eye and extraction of bits of percussion-cap or other foreign body, might be quite sufficient in many cases of traumatic injury where we have been accustomed to advise ablation of the entire globe.

Even though recovery may be a few days later than after enucleation, the patient gains immense advantages where a portion of the tunics of the eye can be preserved ; if in good circumstances, he can wear an artificial eye with far greater comfort and advantage, and if unable to afford the expense of these, he has far less annoying secretion from the conjunctival cavity than where the eyeball has been wholly excised. Of course these considerations would be trivial if, after the operation here recommended, there remained any risk of sympathetic inflammation of the other eye ; but the removal of the ciliary region, together with any foreign body, provided such may be lodged within the eye, seems to offer ample security against this danger.

CASES ILLUSTRATING TWO RARE DISEASES OF THE EYELIDS. By Charles Stedman Bull, M.D., New York.

I. TARSITIS SYPHILITICA—GUMMY INFILTRATION OF THE TARSUS.

Infiltration of the tarsus with a gummy deposit is a rare lesion in constitutional syphilis.* *Michel* describes it as a chronic indolent infiltration of the tarsus, which does not involve the external skin. The process of infiltration is, however, not always an indolent or passive one, if one may judge from an experience of a single case. *Magawly* has described four cases of this kind in the *St. Petersburger Med. Zeitschrift*, Bd. XII. heft 4, and his paper is referred to by both *Nagel* and *Michel*. In two of his cases the lower lid was involved in an apparently homogeneous, non-fluctuating tumor of the size of a small pigeon's egg, accompanied by some little œdema of the conjunctiva and swelling of the rest of the affected lid. In his other two cases the upper lid was involved and the tumor more circumscribed. In one of the latter cases, after the tumor had disappeared, it was found that the tarsus had entirely lost its normal resistance.

In 1873 *Vogel* wrote an inaugural treatise entitled, "Perichondritis of the Tarsal Cartilage," in which he reports a case of syphilitic infiltration of the tarsus, resembling *Magawly's* cases. The affection was characterized by a marked swelling and redness of the lids of the left eye. The swelling was not homogeneous, but varied in density in different places. The margin of the lid was movable over the swollen parts and intact, with the exception of a small spot of ulceration. *Vogel* regarded it as a chondritis or perichondritis of the cartilage of the lid. If we accept *Waldeyer's* view that the tarsus contains no cartilage cells, this cannot be regarded as a chondritis. After seven weeks of administration of potassium iodide the swelling of the lids entirely disappeared. In this case the primary lesion had occurred eight years before.

In the "Klinische Monatsblätter für Augenheilkunde" for January, 1878, *Fuchs* reports three cases of tarsitis syphilitica, met with in Arlt's clinic during the past four years. The first case was a man with a dense, smooth, painless swelling of both lids of one eye, which

* Graefe und Saemisch, Handbuch der Augenheilkunde, IV., 1, p. 441.

had lasted for four weeks. The period of infection was not known, but was probably recent, as there was still upon the glans penis a partially cicatrized ulcer, a papular syphilide upon the face and body, and enlarged cervical glands. The patient could not open the eye, but the lids were easily everted. The tarsus was very much thickened, but retained its normal shape in both lids. Conjunctiva not involved; entire loss of cilia on both lids; small ulcer at external commissure of lower lid. In about four weeks the patient was discharged cured. *Fuchs'* second case was a woman, æt. 34, who contracted a chancre four years before, followed by various constitutional symptoms, among others, left hemiplegia, from which she recovered in four months. Two years later the left upper lid began to swell, and the infiltration became so dense that the eye could not be opened. Six months later this ulcerated, remained open for four months, and then healed, the lid gradually regaining its normal state. Six months before *Fuchs* saw her the same thing developed in the right upper lid. The whole tarsus was very much thickened, but retained its general shape, and here also the cilia were wanting. The same treatment by mercurial inunction and potassium iodide gave the best results, though requiring a somewhat longer time than in the first case.

Fuchs' third case was a man, aged twenty-eight—initial lesion six years before. In this case the process was a rapid, active infiltration accompanied by great pain. It was in the right upper lid and had lasted eight days. It grew so rapidly and the pain became so severe that an incision was made in the tarsus, which showed a brawny yellow surface, and there was no hemorrhage. By constant use of mercurial inunction, potass. iod., and the local application of tincture of iodine for three weeks, the swelling of the lid began to diminish, and at the end of two and a half months the patient was discharged much relieved, though the tarsus was still hypertrophied, but soft and yielding, and the pain had entirely disappeared. The final result reached in this case is not known.

The following case was under the writer's care during the past year, and its rarity will perhaps excuse a detailed account.

The patient was a young man, aged twenty-seven, a bartender, who applied for treatment in November, 1877. He had contracted syphilis about four years before, the initial lesion having been on the glans penis near the mouth of the urethra. The chancre did not heal for nearly six weeks, and in the meantime he had enlargement of the inguinal glands and a general eruption all over his body and face. The next manifestation of constitutional trouble was a series of

mucous patches in the mouth and on the tongue, and a painful ulceration on the right side of the fauces. During the second year there appeared another eruption, which was papular, and his hair began to fall out. He had never had any systematic or long-continued treatment. His eyes had been always perfectly sound until six weeks before I saw him, when he noticed that the lower lid of the left eye felt heavy and large; and on looking in the glass the lid was seen to be slightly swollen, the skin a little reddened, and the conjunctival surface felt rough. There was no pain and no secretion of any sort, and vision was undisturbed. These symptoms continued to slowly increase, without any pain or discharge, until he presented himself for treatment. When I saw him the lower lid of the left eye was very much swollen, making a tumor as large as a robin's egg, the skin very much reddened over it, and the swollen lid pressed closely against the eyeball. The tumor was hard, resisting, solid to the touch, and absolutely painless. The lid could not be everted, but by pulling it away from the eye the conjunctiva was seen reddened, but not markedly so. The tumor seemed to be homogeneous throughout, and for some time past had caused constant epiphora from compression of the punctum and canaliculus. There was a pustular eruption on the face and neck, and a few spots on the dorsum of the hands. Convinced of the syphilitic nature of the palpebral lesion, I placed the patient immediately upon the mixed treatment, using half an ounce daily of mercurial ointment upon the soles of the feet, and commencing with potass. iodid., grs. xv., three times a day, and rapidly increasing the dose. After about ten days of this treatment the swelling of the lid began to soften, and the inunction was used on alternate days. At the end of the third week the swelling had diminished considerably, and the mercury was discontinued, the potass. iodid. being given in grs. xxx. doses. At the end of the sixth week the tumor had entirely disappeared, the lid resumed its normal consistency and motility, and the cutaneous eruption was rapidly fading out; and at the end of the eighth week the patient was discharged cured.

This seems to have been a gummy infiltration of the entire substance of the lid. As the tumor disappeared and the patient recovered, we have not the advantage of a microscopical examination of the lesion, but the infiltration, in all probability, started in the tarsus, and spread thence to the other tissues of the lid. The conjunctiva did not seem to be involved. After the extreme density of the swelling had given way, the seat of the hypertrophy was easily lo-

cated in the tarsus, which retained more or less perfectly its shape. In this case there was a complete absence of the cilia on the lid, due probably to compression of the hair-follicles by the gummy infiltration of the surrounding tissue. After the swelling had diminished sufficiently to admit of eversion of the lid, in various places through the conjunctiva could be seen a brawny, yellowish-white appearance of the infiltration, which slowly disappeared as the absorptive process went on. The cure is probably not a complete one, for with so much and dense an infiltration there must result more or less deformity of the tarsus, either from absorption by compression, or from softening of its tissue. In all the cases reported, this making the ninth, the course seems to be a very chronic one, though a cure is no doubt hastened by an energetic antisyphilitic treatment.

II.—Amyloid Infiltration of the Lid and Orbit.

Antonio D., æt. 4½, born in New York of Spanish parents. Child has never been robust, and is of marked strumous diathesis. Has had frequent attacks of phlyctenular keratitis, and bears numerous cicatrices in the neck of former glandular suppuration. Has a pale, waxy complexion, feeble pulse, and is of stolid demeanor. First seen by the writer on January 24, 1876. About three weeks before, the child woke up one morning with a slight redness and swelling of the outer part of the left upper lid, near the orbital margin. There was no pain and no secretion from the conjunctival surface. These symptoms steadily increased until he was brought for treatment. At this date the left eye was almost completely closed by the overhanging swollen lid, and the child had lost all power over it. The skin was moderately reddened, but there were no superficial vessels visible either on the lid or vicinity of the face. The swelling was a tense, hard, uniform thickening of all the tissues of the lid apparently, being most marked near the outer canthus. The eyeball was markedly limited in its motility upward and outward, but moved freely in other directions. The media were clear, and there was nothing abnormal to be seen in the fundus. The lid could not be everted, and the sulcus between the lid and the superior margin of the orbit was filled up by the inflammatory process, so that the finger could not be pressed in between the roof of the orbit and the eye. There was no tenderness on pressure along the orbital margin, and the child never complained of any pain. It seemed probable that this was a low

grade of cellulitis of the lid and its attachments, and possibly also of the tissues of the orbit. The infiltration was limited on the temporal and nasal sides by the external and internal canthal ligaments, but spread back into the orbit. The symptoms slowly progressed to February 16th, when there was a decided increase in prominence of the upper lid, the eyeball was pushed more downward and inward, and at the same time there began to be some exophthalmus. All motion of the eye upward was lost. The palpebral and ocular conjunctiva was very much injected, and there was some muco-purulent secretion. Vision was still normal, and there was no change visible in the fundus. For the last two nights the child had complained of pain in the orbit and forehead. Two days later the preauricular gland was noticed to be indurated and swollen, and the general condition of the child was unsatisfactory. Up to this time a simple tonic, restorative, and expectant plan of treatment had been followed out, and in addition, potass. iodid. was now administered. On March 1st the symptoms were all very much increased—the exophthalmus more marked, very little motion of the eye; there was an ulcer of the cornea just above the centre, with a rather wide zone of opaque infiltration around it—the preauricular gland was larger, and the swelling was more pronounced along the superior orbital margin, and encroached upon the forehead. For the last few days there was a deep-seated pain in the orbit, and great febrile action all through the night. It was decided to make an exploratory incision into the orbit, in hopes of finding an abscess and giving exit to the pus, the opinion still being held that it was an orbital cellulitis. After much demur the parents consented, and on March 3d the patient was etherized, and an incision, 1¼ inch long, was made along the orbital margin from the supraorbital groove outward, and about half an inch deep. This cut was made through a very dense, unyielding tissue, and did not open into the orbital cavity, so dense was the infiltration. The incision was then deepened until the bony edge of the orbital roof could be felt, and then a straight, sharp bistoury was thrust backward for about an inch, keeping the blade well away from the eyeball. Not a drop of pus was met with, and the tissues of the orbit were found densely infiltrated and converted into a brawny mass. The hemorrhage scarcely amounted to a few drops, and came almost entirely from the vessels of the skin. A small, irregularly quadrilateral piece of brawny tissue was removed from the orbit through the incision, and when washed, was of a dirty yellow color, absolutely bloodless, and very dense, like the thick rind of bacon.

The immediate result of the incision was a slight diminution of the orbital tension, so that the pain was less complained of, and the eye seemed a little more movable, but this effect was merely temporary. The pain returned, and the exophthalmus seemed to increase again after the closure of the wound, which occurred on the sixth day. On March 13th, the whole cornea became hazy, the infiltration spreading from the central ulcer. The latter had not perforated, but the pupil had become contracted and could not be dilated. On the 12th a purulent discharge began in the left ear, accompanied by severe pain in the ear and left side of the neck. The child cried almost constantly with pain in the eye and ear, had a high fever, pulse 140, and the mother said that he neither ate nor slept. On March 15th the cornea sloughed at the centre, and the iris and lens prolapsed in the opening. It was deemed advisable to enucleate the contents of the orbit at once, but this the parents refused to have done, and they withdrew the child from observation.

It was afterwards learned that the child lived several weeks longer, became very much emaciated, and died comatose. No autopsy was allowed.

The infiltrated tissue removed from the orbit through the long exploratory incision gave the usual reaction with iodine and sulphuric acid, turning brownish-red in spots on the addition of a watery solution of iodine, and changing into a dark blue, almost purple, when sulphuric acid was used.

The microscopical examination of the specimen was not entirely satisfactory, owing to the small amount of tissue at hand. After hardening in Müller's fluid and alcohol, sections were made, which showed in some isolated spots a luxuriant granulation tissue. There were very few vessels, and in those which existed the walls were very much hypertrophied, mainly at the expense of the calibre of the vessel, which in some could scarcely be distinguished. The infiltration seemed to involve not only the coats of the vessels, but to extend for a greater or less distance into the surrounding connective tissue. This condition of the orbital tissue plainly accounted for the small amount of hemorrhage. The infiltration had involved the walls of the blood-vessels, had narrowed their calibre, and eventually obliterated the vessels altogether. There was very little trace of either connective or adipose tissue, but the main mass seemed to be a homogeneous, structureless infiltration. From a clinical standpoint the morbid processes, without doubt, began in the orbital tissue, and

probably not far from the tarsal fascia and palpebral ligaments. The infiltration spread forward into the lid and up on the forehead as well as backward into the orbit, and the latter direction was not taken until after the disease had lasted for some time, for the exophthalmus was a comparatively late symptom. It would have been extremely interesting to have been able to follow the extension of the infiltration into the tissues of the lid, and note to what degree they were involved. The lid, towards the last, felt more like a piece of sole-leather than anything, so dense, unyielding, and homogeneous did it seem to be. Whether the perforation of the membrana tympani with the purulent otitis media had any connection with the orbital process, it is impossible to say, but it is probable that there was some such connection. The death of the child by coma preceded by other brain symptoms, points almost conclusively to an extension of the orbital process backward into the cavity of the skull, and in this way the ear may have become secondarily involved. It is very unfortunate that the history of the case could not be completed by a careful autopsy.

SYPHILITIC GUMMATA OF THE CONJUNCTIVA. By Charles Stedman Bull, M.D., New York.

Gummy infiltration of the conjunctiva, whether circumscribed or diffuse, is probably the least common of all syphilitic lesions of that membrane. Gumma of the sclera, involving sometimes the fibrous capsule of the eyeball, is not an uncommon late symptom of syphilis; but gumma of the conjunctiva is certainly rare. Late manifestations of syphilis occurring in this neighborhood are rarely limited to the conjunctiva, but, beginning almost always in other tissues of the eyelids or eyeball, involve the mucous membrane by contiguity of structure. The following case of gummy infiltration of the conjunctiva with gummata of the sclera was under the author's care. The combination of constitutional syphilis with a certain group of symptoms that somewhat resembled scurvy, the general marasmus which existed, and, finally, the death from pneumonia, make up an interesting case.

Louis Budlow, æt. 56, native of Canada, and by occupation a laborer, was admitted to Charity Hospital, Blackwell's Island, August 11, 1877. The patient is a tall, robust man, but prematurely aged in appearance. Always healthy until the autumn of 1876, when he caught a severe cold, and was admitted to the hospital for simple bronchitis. At the end of ten days he was discharged cured, not having been confined to his bed for a single day. Remained well until the following summer, when he contracted a cough, and was readmitted to the hospital on August 11th. He had a dry cough, pain in the chest on both sides running through to the back, an elevated temperature and accelerated pulse, with all the physical signs denoting pleurisy, with slight effusion on both sides.

Fifteen years ago he had suffered from gonorrhœa, but positively denied ever having had the initial lesion of syphilis. Admitted to the ophthalmic ward of the hospital August 16, 1877. Two or three days before, he had felt a sensation of soreness in the left eye, and on the following day in the right eye. The pain became dull, burning, and continuous, and was located in the eyeballs. Whenever he swal-

lowed, whether solids or liquids, he felt a severe pain in the eyes, and this was immediately followed by marked blepharospasm.

Nothing particular about the man's general appearance, except a dull yellow complexion and a look of hopeless wretchedness. An examination of the abdomen and back showed the marks of an extensive old eruption, consisting of small white cicatrices, with deep brown pigmented margins, which have existed for twenty years. Upon the hands and face there was a peculiar eruption, composed of elevated spots with flat tops, some round, others oval, yellowish red in color, with a narrow dark red areola. They were neither painful nor tender to the touch, and presented a mid state between vesiculation and pustulation. On opening these a thin, watery pus mixed with blood could be pressed out. These vesicles or pustules were scarcely large enough to be called bullæ, and yet there was conveyed to the mind a general idea of pemphigus. One of the largest pustules was on the left upper lid, and there were two smaller ones along the ciliary margin. There were several on the face, and the remains of a large one on the bridge and right side of the nose. On the hands the eruption was almost entirely on the dorsal surface, and was grouped around the knuckles and between the fingers. Some vesicles on being opened gave exit only to blood.

The eyes were almost identical in appearance. Surrounding the corneæ there was a growth, most marked on the outer and lower sides, varying in height from one and a half to two lines, seated in and beneath the ocular conjunctiva. This growth extended away from the cornea on all sides about one-third of an inch, was pale yellow in color, moderately hard to the touch, with an irregular, knobby surface, and apparently destitute of vessels. The conjunctiva was firmly adherent to this growth, and the cornea was embedded in this wall like a watch-crystal in its frame. On being incised it cut like brawn, and the hemorrhage was very slight. Upon the sclera of each eye, between the tendons of the superior rectus and external rectus muscles, and partially covering the latter, was an extensive and extremely well-marked gummy infiltration of the sclera, very vascular, very tender to the touch, and especially painful when the eyes were turned outward. This infiltration extended backward symmetrically in the two eyes, but was somewhat more extensive in the right eye. The media were clear, and an ophthalmoscopic examination revealed nothing abnormal. The patient's breath was fetid, the buccal mucous membrane very pale, and bore the marks of the teeth along the cheek. Tongue moist and thinly coated; appe-

tite poor; bowels obstinately constipated. Temperature 100¼; pulse 102; intellect dull, answered questions very slowly. Physical signs of pneumonia well marked over both lungs. A diagnosis was made of syphilitic pemphigus, gummy tumor of the sclera, and pericorneal gummy infiltration of the conjunctiva, and double pleuropneumonia. The patient's condition was very bad, and a vigorous tonic and restorative treatment, combined with mercurial inunction and potass. iodid., was at once instituted. Quinine, dilute sulphuric acid and iron were regularly administered, potass. iodid. grs. xx. ter die, and the inunction night and morning, and a liberal diet of milk, eggs, beef-tea, and eight ounces of whiskey daily.

August 25th.—The patient grew slowly worse, with occasional delirium, and in the intervals of the delirium the stupor slowly deepening. The dose of potass. iodid. increased to grs. xxx. Diminution of conjunctival infiltration!

August 26th.—Integument dusky, breath very fetid, gums spongy and bleeding. Urine is turbid, sp. gr. 1015, contains a trace of albumen, some pus-corpuscles, and a large number of triple phosphate crystals. Spots on the hands are growing larger and approaching bullæ in appearance. Skin very dry and hot. A swelling has made its appearance over the inner condyle of the right arm, painful on pressure. This swelling soon extended down the right forearm, pitted on pressure, and was doughy to the touch. The right hand, both legs and feet, œdematous.

August 27th.—Painful diarrhœa, attended by tenesmus, rumbling and bloody discharges. Face puffy; repeated bleeding from the gums and nose. Patient is semi-comatose. Consolidation now detected at apices of both lungs, with some friction-sounds on left side. *The scleral growths and the pericorneal conjunctival infiltration have almost entirely disappeared.* The spots on the hands and face are increasing in size and becoming more red in color.

August 29th.—Diarrhœa ceased; mercury discontinued. Transferred to pavilion on account of delirium. Right cheek swollen, especially near angle of mouth, and a spot of ulceration on buccal surface, opposite the first molar tooth in the upper jaw. Right forearm red, hot, and tense.

August 31st.—Right cheek swollen enormously, eruption decidedly hemorrhagic.

September 3d.—Incisions in right forearm necessary to relieve tension—considerable pus discharged through the incision, and patient much relieved. Swelling of right cheek still more marked, and at

one point on mucous surface a somewhat extensive black slough. *Eyes entirely well.*

September 6th.—Constant delirium; slough in cheek extending; eruption drying up. Arm doing very well, scarcely any febrile action.

September 16th.—Large hole sloughed through the entire thickness of the cheek. Delirium has turned to coma. Steady improvement in the arm.

September 19th.—Death at 4 P.M. in deep coma.

Autopsy, twenty and a half hours after death. Body emaciated. On back of hands a number of bluish red spots, varying in size from a three-cent piece to a dime. Beneath the right malar bone is a round, clean-cut ulceration of all the tissues of the cheek, which extends to the angle of the mouth, but does not involve it. All the tissues involved in the ulceration form a soft, pulpy, brownish red, offensive mass. Right half of the tongue destroyed by ulceration. Right half of inferior maxilla, from symphysis to angle, is denuded of periosteum and bare, and the same condition exists in the right superior maxilla.

Calvarium unusually thin. Dura mater normal. Increased amount of cerebro-spinal fluid. Pia mater œdematous, sinuses empty, vessels at base of brain normal. At posterior portion of right hemisphere is a spot of softening about an inch in diameter, breaking down immediately on section.

The *thoracic cavity* contained about ten ounces of clear serous effusion—on the right side a few bands of adhesion at the apex—on the left side a few bands of adhesion at the base to diaphragm. Upper lobe, central portion of middle lobe, and greater portion of lower lobe of right lung in stage of gray hepatization, associated with emphysema. In left lung, entire lower lobe the seat of catarrhal pneumonia passing into the gray stage—upper lobe emphysematous and œdematous.

Heart.—Both ventricles hypertrophied and dilated; on leaflets of aortic valves some soft vegetations; in pericardial cavity about half an ounce of clear serous effusion.

Abdomen.—Liver fatty; capsule of spleen thickened, and its parenchyma almost diffluent. In cortex of kidneys several small abscesses, size of a split pea; in both pyramidal and cortical portions are evidences of chronic interstitial nephritis. Pelves and ureters contain a small amount of pus.

Intestines normal, except a few chronic ulcerations in the cæcum.

Situated in the median line of the neck, below and between the

lateral lobes of the thyroid gland, is a tumor as large as an English walnut, just beneath the subcutaneous fascia. It is soft and fluctuating, and found filled with disintegrated coagulæ. On the internal surface of its walls were a few calcareous plates. Pharynx and trachea normal.

The points of interest in the case are:

1. The rarity of the pericorneal and conjunctival growth.

2. Its coincidence with, and yet independence of the gummy infiltration of the sclera.

3. The cyst in the neck, with its disintegrated contents, unrecognized before death.

4. The vesiculo-pustular eruption, becoming pemphigoid and subsequently hemorrhagic.

5. The hemorrhagic diathesis as shown in the various symptoms.

Of course, gummy infiltration of the sclera and episcleral tissue is a common enough manifestation of constitutional syphilis, and the scleral gummata in this case occupied the usual site in the neighborhood of the external rectus muscle. Though the infiltration was extensive, this is not uncommon, and it spread in the usual direction from before backward, toward and beyond the equator of the eyeball. Furthermore, it was binocular and symmetrical, as is usually the case in syphilitic lesions of the eye. As regards the conjunctival gummata in this case, no ulceration occurred. Their appearance at first, and their mode of growth, resembled very much the description given by *Smee* of his case. They began as a dirty discoloration in small patches in the conjunctiva around the cornea, with at first scarcely any elevation. These patches then coalesced, gained in thickness and breadth, and thus formed the wall around the cornea. They then remained unchanged until the system came under the influence of the mercury, and then, in spite of the patient's generally depraved physical condition, they rapidly subsided and disappeared before the scleral infiltration was absorbed. The conjunctiva and sclera were normal in appearance between this circum-corneal wall and the gummy tumor of the sclera, near the external rectus muscle. There was no increased vascularity of the eyeball, except in the immediate neighborhood of the latter. The symmetrical arrangement of the double infiltration in the two eyes, and what might be called their symmetrical independence, was of considerable interest.

A third point of interest was the cyst in front of the trachea, the existence of which had not been recognized before death. This cyst

had no connection with the thyroid body or trachea, and had probably existed for some time, perhaps years, if we may judge from the presence of the calcareous plates upon the inner surface of its walls. The exact pathology of the cyst it is very difficult to determine. There were no signs of interference in the function of either trachea or œsophagus during life, so that its rate of growth is unknown. In view of the constitutional syphilis, its origin had been probably a gummy deposit in the subcutaneous tissue of the neck, just below the isthmus of the thyroid and in front of the trachea, which had subsequently undergone retrograde metamorphosis. Its contents found at the autopsy were regarded as disintegrated clots, but the presence of the blood may be accounted for by the marked hemorrhagic diathesis. The wall of the cyst varied in thickness from three to five lines, its inner surface was smooth, as if covered by a membrane, except where the calcareous plates were situated, and the outer surface rough, owing to adhesions to the surrounding tissues. Microscopic sections showed that there was no distinct lining membrane, nor any trace of epithelium, and the smooth appearance of the inner surface was probably the result of pressure of the contents. The wall was composed of a large number of layers of fibro-areolar tissue, with some cells, fusiform and round, with nucleus and granular contents. These layers of fibres were packed very closely together, forming a dense, strong wall, which had probably originated in the following way. A gummy deposit had occurred in the subcutaneous areolar tissue, which by its presence had set up a localized inflammation, lymph was poured out around the gumma, became organized, and thus the growth went on. At some subsequent period the contents of the tumor began to break down, disintegrated and perhaps suppurated, and at this stage the hemorrhage may have occurred and mingled with the contents. As the process of absorption went on, these bloody extravasations probably recurred again and again, and thus the cyst-wall had no opportunity of collapsing, and hence no obliteration of the cavity occurred.

The accompanying eruption was another interesting feature in the case. Its ill-defined, nondescript character was at first unsatisfactory. The spots were as often pustules as vesicles ; and even when more truly vesicular, the surrounding areola was different from that usually seen in this variety of eruption. Only in a few of the spots was the areola at all well marked, and the vesicles were not large enough to speak of them as bullæ until towards the close of life. The ill-defined character of the eruption was no doubt the sign of de-

fective development, due to the extremely low, marasmic state of the man's system. As a rule, patients with pemphigus die of marasmus, and very often from pulmonary tubercles or pneumonia. In many cases we also find at the autopsy amyloid degeneration of the liver, spleen, and kidneys, with chronic interstitial desquamative nephritis. The locality of the eruption was also somewhat singular. According to authorities, the favorite place for pemphigus is on the palm of the hand and sole of the foot, on the scalp and brow. But in this case the eruption was on the face below the forehead, and on the dorsum of the hands and fingers. The scars on the back and abdomen might point to a papular or tubercular eruption. As a rule, scars do not give any absolutely characteristic sign by which to recognize the preceding destructive process, though we are sometimes assisted by them in coming to a conclusion as to the nature of the lesion.

The final point of interest was the hemorrhagic diathesis, as shown by the tendency to bleed from mucous and cutaneous surfaces on slight provocation, and towards the end spontaneously. The buccal mucous membrane and tongue were almost bloodless, and the patient had frequently had epistaxis. Subsequently his gums became spongy and bled easily. A bloody diarrhœa made its appearance and was with difficulty controlled, recurring again and again towards the end. The eruption became hemorrhagic, and even at first the contents of the vesicles or pustules was in part blood. As the vesicles became bullæ, the hemorrhagic tendency was still more clearly developed.

A CASE OF SPONTANEOUS CURE OF SUBRETINAL EFFUSION. By David Webster, M.D., of New York.

At the eleventh annual meeting of this society I reported "a case of spontaneous cure of subretinal effusion" which occurred while the patient kept the supine position for a period of ten days. I have now a similar case to report. This case, like the former, occurred in the private practice of Dr. C. R. Agnew, and was carefully observed by him as well as by myself.

April 8, 1876.—W. B. H., æt. 47, clerk, has been very near-sighted, in both eyes, all his life. A week ago he first noticed a dark spot over his right eye. This dark spot gradually increased in size until now there remains only sufficient vision to count fingers at a distance of one foot, and that only in the extreme infero-nasal periphery of the visual field. Ophthalmoscopic examination shows detachment of the retina.

The left eye has never been of much use to the patient. It is myopic over one-half, and has vision less than $\frac{4}{200}$. Inspection shows that it is the subject of corneal and lenticular opacities, with very extensive staphyloma posticum.

A trial of the supine position was advised.

May 16.—The patient states that he went home and lay on his back twenty-three days, in a moderated light. He has vision $\frac{10}{200}$ with his spectacles, and he feels that his sight is improving every day. No separation of the retina can now be seen, but in the vitreous are some floating bodies.

April 8, 1878.—It is now just two years since we first saw Mr. H. His right eye now has vision $\frac{20}{100}$ with $-\frac{1}{24}$, which he wears all the time. The visual field is complete. There are still some floating bodies in the vitreous, and large staphyloma posticum.

Mr. H. gives the following history of his recovery: he had no drops put into his eyes, nor were they bandaged when he lay on his back. After he lay on his back two or three days, everything looked of a beautiful *purple* color. After that an appearance like steam came over his eye, and that kept growing clearer and clearer all the

time, and the last few days there was a little black spot which kept going round and round like a pin-wheel, and growing smaller and smaller until it finally disappeared. After he got up everything was clear, but of a kind of a *greenish* cast. This greenish tinge lasted for a week, and then disappeared. Vision has improved ever since, and he believes it to be better now than before the detachment. He has been engaged in his business as clerk for the last seven months.

Dr. Prout remarked that in the treatment of subretinal effusion the prolonged recumbent position, as proposed by Samelsohn in 1875, is to a certain extent illogical, and in very many cases perturbating. Every one has noticed that cataract patients are sometimes injuriously affected by the necessary confinement to bed after extraction. A patient with a felon on his finger will not allow it to hang down, nor find the greatest degree of comfort for it in the horizontal position; he will carry the hand so that the blood may easiest run *from* the affected part. The quiet lying in bed keeps the blood in the head and *about* the orbit, even if it is assumed that the intraocular blood-pressure remains unchanged, which the speaker by no means admits. Why is it that in seriously inflamed eyes and after operations it is necessary to forbid mastication?

The subretinal fluid tends to gravitate to the lowest part of the eye. Rest in bed on the back, therefore, would maintain the separation where its injurious effects are greatest. Could the patient lie prone the fluid would tend to gravitate to the ciliary region, where the blood-supply, and consequently, we may assume, the absorbent power are greatest, and his chances of recovery would be improved.

But the real curative agent is *rest*, as nearly absolute functionally and mechanically as possible, and to obtain this great good the smaller evil of the faulty position must be tolerated, unless we can find a substitute. Very few patients will, while allowed to move about, keep the head and eyes at rest. Hence the necessity for the quiet rest in bed. I will illustrate this by a case. J. W. P., aged about 60, before coming to me had already tried for more than two weeks the recumbent position. The effect on the eye was beneficial, and being a man of robust health and excitable temperament, the bed had become excessively irksome to him. The visual field was lost except to the outer side. Still, as nothing else promised any relief—the other eye had been lost twelve years before —he wished to try this mode of treatment again. He was told that functional and mechanical *rest* was the one thing needful, that the disturbing in-

fluence of lying in bed was prejudicial, and that rest could be obtained without its being necessary to keep the horizontal position constantly. He could bandage his eye and sit up every day, taking great care to avoid sudden movements, etc. He went home, sat in an easy rocking-chair, which put his body at an angle of about forty-five degrees with the horizon, and went to sleep expecting to commence the bed-and-rest treatment on retiring that evening. He slept from two to six P.M., and on waking was astonished to find a very nearly complete restoration of the visual field, with, however, quite dim vision. In order to avoid any motion he continued in the chair all night, going to bed next morning. Nearly every day he sat up in the chair, avoiding quick movements of the body and keeping his head as still as possible. He could not stay all day in bed with any comfort, and it was clear that to attempt to maintain absolute quiet would very much injure his general health. This course was maintained for about three weeks, when he was allowed to go out for exercise.

The condition of the retina has not improved; the visual field is of very nearly normal extent, but vision continues very bad.

NOTE.—As a final effort, local depletion, which before did good, but the improvement did not persist, was again resorted to, by means of Heurteloup's artificial leech, but with injurious result.

A CASE OF MULTIPLE RUPTURE OF THE CIRCULUS IRIDIS MINOR, WITHOUT OTHER INJURY TO THE EYEBALL. By Dr. J. J. B. Vermyne, New Bedford, Mass.

Uncomplicated rupture of the sphincter pupillæ seems to be of such rare occurrence, that I feel justified in reporting the following case:

On the 11th of February, 1877, I was called to see Mr. E. P., of New Bedford, who on the morning of that day had received an injury to his right eye. While trying to turn off a banjo-rim, composed of pieces of differently colored wood strongly glued together, after some few turns of the lathe the gouge caught in the wood, with the result that the rim was broken in several pieces, large and small, one of which struck him with considerable force across the nose and the right eyebrow, knocking him over. At the time of the injury there appeared a bright light, there was some pain around the eye, a few drops of blood from a cut on the nose, subsequently sensitiveness for light and a blurred appearance of objects. After two or three hours there was considerable pain in the eye and the head, for which he made cold applications, but finding no relief, he sent for me. Being absent from the city, another physician was called, who gave a quieting draught and made some application to the eye, requesting at the same time to send for me on my return. I saw the patient at 8 P.M. He was a healthy-looking young man of eighteen. He told me that after taking his draught he had gone to sleep, had slept almost the whole afternoon and felt greatly relieved, there being hardly any pain in the eye or the head. On removing the bandage from his right eye, I found a widely dilated pupil, somewhat notched on the inner and lower part, a little below the horizontal meridian. There was some hemorrhage in the anterior chamber, covering the lower margin of the pupil. The vision, according to patient's statement, was blurred, otherwise slightly affected, and as he complained of the strong light, I postponed further examination, in the belief that the physician who first saw him had applied belladonna. Before visiting my patient the next morning, this physician told me that he had prescribed an infusio belladonnæ, in case the pain should not subside before my return, but had not applied any

himself. My patient was walking about the room, complaining only that the light hurt him. On making inquiries I found that the infusion of belladonna leaves had not been applied, as the pain subsided very soon after taking his quieting medicine. On examining the eye with focal light and ophthalmoscope, there was slight conjunctival injection, hemorrhage in the anterior chamber still covering the lower margin of the pupil, which has the size of paralysis and is somewhat irregular in its margin. A cursory examination of the vision of this eye shows that it is slightly blurred for small objects, especially at short distance. Behind the iris the media are perfectly clear. There is a little abrasion of the skin on the eyebrow and a small cut on the nose. No more pain in eye or head. I considered his case one of mydriasis from shock, and continued cold applications, alternating with compressory bandage. The patient was seen again two days after, when the blood in the anterior chamber had entirely disappeared, and the lower part of the iris, now visible, presents the following appearance: a little inside of the vertical meridian there is a downward coloboma, at its wider upper part about the size of the pupil of the other eye. It extends nearly to the junction with the cornea, where there is a small rim of iris-tissue left. Presenting somewhat a triangular shape with rounded angles, it has, with the superposed dilated pupil, a pear-form appearance. In the lower

tapering part can be seen some small shreds of iris-tissue, like fine threads. A little above the nasal end of the coloboma is a small linear rent in the pupillary margin, and following this margin from the outer end of the coloboma it is notched or scolloped for about one-fourth of its circumference; altogether there is about two-thirds of the pupillary margin involved; the dilatation persists. All other parts of the eye appear to be perfectly normal. With favorable illumination the lower margin of the lens with the zonula Zinnii can be distinctly seen through the coloboma. The examination of V.

showed E. for both eyes. O. S. V. = $\frac{15}{15}$. O. D. V. = $\frac{15}{40}$, improved by stenopæic apparatus to $\frac{15}{30}$ and some letters of XX. Nearest point for O. S. Snellen $1\frac{1}{2}$ at $3\frac{1}{2}$ inches, O. D. the same at 8 inches, again improved to $6\frac{1}{2}$ inches by the stenopæic slit. There seems to be some contraction of the pupil when strong light is used. For the same degree of illumination the dimensions of the pupil are for O. S. $\frac{1}{8}$ inch, for O. D. horizontal diameter $\frac{1}{4}$ inch, vertical to the termination of the coloboma, nearly $\frac{3}{8}$ inch, width of the gap in the pupillary margin at upper part of the coloboma nearly $\frac{1}{8}$ inch. Calabar-bean was applied, first in the form of gelatine, afterwards as one per cent. solut. of sulphate of eserine, but, though temporarily improving the condition of the pupil, without permanent effect. I had some fears in regard to the usefulness of the injured eye. But I saw the patient repeatedly afterward, the last time only two weeks ago, and although the appearance is still the same, the near point of O. D. has approached to 5 inches; there is distinct reaction of the pupil, and when coming suddenly in a bright atmosphere, his vision is confused for a very little while, but this soon leaves him. He uses both eyes in reading and writing, distance about 10 inches.

The literature on diseases of the eye, so far as I could consult it, does not give many cases of rupture of the sphincter pupillæ, and almost unexceptionally it is called a rare injury. Lawson on Injuries of the Eye, page 127, under the head of "lacerations of the iris without rupture of the external coats of the eye," says: "I refer now to those *rare* cases of injury in which the structure of the iris is torn by a blow on the eye, but without any rupture of the sclerotic or choroid. From a sharp blow I have seen the pupil present the appearance as if it had been notched, a small tear having been made by it through the pupillary margin of the iris, and yet there was no laceration of the external coats of the eye, nor wound of the lens." He reports the case observed by Critchett, where the rent in the iris was so shaped as to form a second pupil above the normal one, separated from the latter by a small bridge of iris-tissue, and not encroaching on the ciliary attachment.

Zander u. Geissler, in *Verletzungen des Auges*, p. 349, say: "As far as we know, isolated rupture of the circulus iridis minor has only been described by White Cooper." They quote the history of four cases observed by the latter, in all of which dilatation of the pupil remained permanent, and all of them producing a considerable trouble in the use of the eye for close distance.

Wharton Jones, p. 427: "When the iris is torn across there is

produced a state resembling coloboma iridis." He reports no cases.

Seitz-Zehender, *Handbuch d. Augenheilkunde*, p. 305, observes that lacerations in the continuity of the iris-tissue, in consequence of a mechanical force, are very rare; much more frequent is the separation of the peripherical margin of the iris from the ciliary muscle.

In Stellwag v. Carion's *Handbuch d. Augenheilkunde*, I only found an allusion to real separation in the continuity of the iris, whether accidental or caused by operations, as a cause of iritis.

In the fourth volume of Graefe-Saemisch *Handbuch der gesammten Augenheilkunde*, de Wecker says (p. 536): "An exceedingly rare injury, caused by contusion of the eye, is the laceration of the pupillary margin of the iris, such as has been observed by White Cooper, and of which I have observed two cases." In both of these cases there was, however, no permanent mydriasis, and the pupil showed after the injury the pear-form which is commonly observed after iridotomy.

Soelberg Wells (p. 177) speaks of the injury as very rare, and quotes the cases of Cooper and de Wecker.

Meyhoefer, of Gorlitz, publishes a case of quadruple laceration of the pupillary margin in *Klinische Monatsblätter f. Augenheilk.*, February, 1877. He calls attention to the exceedingly rare occurrence of the injury, only quoting the cases of Cooper. In this case the rupture of the pupillary margin was complicated with an extensive rupture of the choroid. The patient regained almost normal vision; the pupil remained the size of paralytic mydriasis.

In the fifth volume of the same journal, page 160 (year 1867), is another case, reported by Dohmen. The rupture appeared as coloboma, extending to the ciliary margin, and a piece nearly one-eighth of the iris was wanting, and was seen fourteen days later downward and inward, deep in the vitreous. In addition there was outward and downward dislocation of the lens, and separation and rupture of the retina.

In von Graefe's *Archiv für Ophthalmologie* there are two cases reported under the head of laceration of the iris. The first one, reported by von Graefe in Vol. I., Part I., p. 405, was a case of wound of the sclera near cornea, with prolapse of a portion of iris. The second case, reported in Vol. II., Part II., p. 161, by D. E. Müller, of Oldenburg, was that of a man of seventy, who had received a blow on the eye thirty years before, and seen indistinctly with it since. A

stick of wood struck the same eye some months before he presented himself. The iris was ruptured in three places and bent inward; the lens had lost little of its transparency, but was movable, and now in front of, now behind the iris, according to the position of the body. The first of these cases does, therefore, not belong to rupture of the circulus iridis proper; the second case is doubtful in this regard.

Rheindorf, Schweigger, and Carter make no mention at all of the injury in their handbooks, although they speak of separation of the ciliary attachment (dialysis), of an inward bending of the iris, and of mydriasis as consequences of injury to the eyeball.

A *résumé* of the preceding shows, therefore, only the cases of White Cooper and de Wecker, that of Meyhoefer and of Dohmen, the two latter complicated with rupture of the choroid or of the retina; and these cases are quoted generally with the assertion that the injury is very rare.

Against this assertion, however, stands the following in *Klinische Beobachtungen aus der Augenheilanstalt von* Dr. J. Hirschberg, 1874, p. 38: "The protracted duration of mydriasis is evidently caused by changes in the uveal tract. Their most simple form is that of rupture of the sphincter, and on careful examination this is found oftener, as would be expected from the observations of White Cooper, de Wecker, and others."

This remark was an additional incentive for reporting my case, the more since, through the kindness of Drs. Williams and Wadsworth, of Boston, I am enabled to mention two more cases.

Dr. Williams had seen one case, but had not taken any notes; but as the case had happened but a short time before he related it to me, he could remember it perfectly well. There was no injury of any important part, except abrasion of the cornea and rupture of the sphincter pupillæ. He believed that the man recovered fair vision in a few days and discontinued attendance.

Dr. Wadsworth saw one case, about six years ago, in a boy of eleven, struck on the right eye by a stone two days before he saw him, in January, 1872. The lids were somewhat swollen after the blow, and both were considerably ecchymosed. Pain in brow the night after injury, not afterward. Some conjunctival congestion, cornea clear, slight turbidity of aqueous from blood, and a clot at the bottom of anterior chamber. Iris shows no change of color, sphincter iridis ruptured in five places, pupil size of paralysis; floating webby opacity in lower part of vitreous; lens clear; veins of retina apparently full, but like those of the other eye, and the whole of fundus

having a little reddish gray tinge, perhaps from effect of hemorrhage in the media. V. about $\frac{15}{100}$. Two days later clot in anterior chamber mostly absorbed; V. = $\frac{15}{20}$. Soon after V. gradually diminished; six months after, general opacity of the lens, and a more dense, cup-shaped opacity of the posterior cortical. No details of fundus to be seen; apparently no defect of field. After the lens became more opaque discission was performed, but vision remained poor, and there were many webs of opacity in the vitreous.

In how far, in the case reported, the permanent mydriasis can be ascribed to concussion of the eye, as de Wecker thinks of White Cooper's cases, or whether the extent of the rupture, which, though presenting the pear-shape after iridotomy, extends over nearly two-thirds of the pupillary margin, is the cause, I must leave undecided. However, as there is now, eighteen months after the accident, a visible contraction of the pupil on strong light, and yet the mydriasis still persists, I feel inclined to the belief that the latter is the case.

TUMOR OF THE CONJUNCTIVA, SIMULATING CYST.

By Dr. Richard H. Derby, New York.

Mary E. T., aged 9, first came under observation January 29, 1878. Patient, a strong, healthy child, for some weeks had suffered from granular eyelids. Tannin in substance, alternating with sulphate of copper, was used with advantage locally. When the patient was first seen the following peculiar condition was noticed: upon eversion of the left upper lid, and directing the patient to roll the eyes down, a new growth, in or beneath the ocular conjunctiva, extending from a line in front of the fold of transmission and along its inner third, downward and inward until it was lost in the tissues about the caruncle. Its lower margin was clearly defined about three lines distant from the corneal margin. The body of the new growth, movable upon the eyeball, was semi-transparent, prominent, at its outer limit flattened. When directed to look at an object held in the horizontal plane before the eyes, the lower margin of the new growth was seen between the eyelids. At first no great inconvenience was

experienced from the tumor; gradually the new growth became more apparent to the patient and her friends, and it was decided to attempt its removal April 27th. Under ether the upper lid was everted and the eye rolled downward as far as possible. An incision was now made along the upper margin of the tumor through a much thickened conjunctiva, and this incision was met by another carried along the lower margin of the new growth. Everywhere a very much thickened conjunctival membrane was encountered. At its central, most prominent part, there was a cavity, containing no fluid.

The wounds thus made by the operation were closed by sutures, and now, in November, 1878, there has been no return of the new growth.

Dr. C. S. Bull, to whom a specimen of the tumor was given, writes as follows:

"I have just finished looking at the specimen of conjunctival or subconjunctival growth which you referred to me some weeks ago. In the small piece of apparent wall of the cavity which was removed I could find no trace of any epithelial lining. It seemed to be made up of connective-tissue fibres and hypertrophied conjunctival tissue. The small piece from the inside consisted only of adipose and connective tissue. There was no cell-growth of any kind."

CASES OF SARCOMA OF CHOROID AND RETINITIS ALBUMINURICA. By Dr. Lewis S. Dixon, Worcester, Mass.

SARCOMA OF CHOROID.

Michael Dunn, a healthy man of fifty, reported that he had been troubled for the preceding two months by severe neuralgic pain in his left eye, and had found no relief from the physicians he had consulted. Vision was $\frac{2}{20}$ and the external appearance was normal, with the exception of a slight circum-corneal injection on the outer edge of the cornea, with some tenderness on pressure over that region. No photophobia, tension same as other eye, and the ophthalmoscope gave no view of anything abnormal within the eye. Atropia was advised and a stimulating lotion given to bathe about the eye. Further and repeated examinations gave no more indication as to the cause of the persistent pain. All sorts of remedies and means were tried without relief. Opiates, chloral, etc., caused so much disturbance of the stomach and head, that they were refused. Tonics seemed powerless and the pain increased steadily. Vision now began to fail, apparently from haziness of the vitreous. Patient was sent to Boston for advice, and iridectomy was suggested as most likely to prove of service, but nothing definite as to the causation was ascertained. The operation was done, and gave some relief for a few days only. After further ineffectual treatment, he went to the infirmary in Boston, and was seen by several of the gentlemen there, but no diagnosis was made; and though the media were moderately clear, no tumor was discovered at any time, yet something of that nature may have been suspected. Enucleation was advised, but not consented to. Vision now failed rapidly until *light* was not perceptible, and pain became so excessive that the patient was nearly crazy. The eye was at last removed, with immediate and entire relief to pain. Health and strength returned rapidly, and in a few weeks he was at work. Examination of the eyeball showed a flat tumor or thickening, occupying one-third of the circumference of the ciliary region, on the outer side of the cornea. This tumor was about $\frac{1}{12}$ of an inch thick at its thickest part, and sloped gradually from the centre on all sides until lost in the natural tissues. The retina was

completely separated, but not involved in the growth, which affected only the ciliary body and the choroid slightly. The sclerotic was somewhat thinned over the tumor. It was examined microscopically by Dr. Wm. H. Workman, who found it to be a round-celled pigmented sarcoma. Six months later he noticed a slight redness at the same relative position on the other side of the right cornea, with occasional twinges of pain. These became more and more frequent, appetite began to fail, and all went on just as before. With the widest dilatation nothing could be seen but a few rather large blood-vessels at the point of tenderness over the ciliary region. Vision remained $\frac{2}{20}$ for some time. For five months the patient grew steadily worse, entirely discouraged, and refusing to take any care of himself. Excessive pain wore out his life. He kept his bed for the last three weeks, but had his senses perfectly till death, and seemed free from any other ailment. Both eyes became troublesome about the same time of year, and he died just one year from the day of the first enucleation. Not being notified of the patient's death until after his burial, it was impossible to obtain the second eye for comparison; although the whole course of the right eye resembled so closely that of the left, that it is quite likely the condition was identical.

RETINITIS ALBUMINURICA.

Patient was a strong, active man of forty-five. He had noticed for a month a slight blurring in the left eye, and almost by chance, stepped in to ask about it. Externally the eyes were in good condition; vision was $\frac{20}{20}$ with the right, and $\frac{10}{20}$ with the left eye. The opthalmoscope brought to view in both eyes a singularly complete and brilliant example of that form of retinitis which accompanies Bright's disease, the peculiar splashed or stellate appearance being abundant and marked, the splashes sharply defined and of a metallic, silvery white. On the most careful questioning the patient seemed to be entirely free from any of the symptoms of Bright's disease, except that occasionally he needed to urinate during the night, and sometimes had headache. He was strong and hearty, and did "the work of two men." On examination of the urine, neither heat nor nitric acid gave anything but the faintest indication of albumen, though the carbolic and acetic acid test gave a more decided result. The microscopic examination, though careful, and repeated with eight or ten slides, gave nothing that could reasonably be considered casts. Being shaken in my confidence as to the diagnosis, I nearly filled a

long pipette with the urine drawn from the bottom of the conical glass, which had been settling for about eighteen hours; this was corked at the top and hung up vertically over night. Then on warming the air at the top of the tube with the fingers, the very bottom drop was received on a slide and examined, with the result of finding abundant hyaline and granular casts. The patient was sent, with a note, to his physician, who, after examining the casts already found, was reluctantly convinced of the truth of the diagnosis, and took charge of the case, advising the patient to settle up his business affairs and travel for his health. Four months later he returned, feeling that we must have been mistaken, his health being perfect and vision normal in both eyes. There was at this time considerable albumen in the urine, and casts were easily found. The ophthalmoscope still enabled one to see the distinct and brilliant display of albuminuric retinitis, the splashes resembling frosted silver-work, and quite covering the fundus for a distance of three or four lines from the disc. He continued his work as usual, and in excellent health and appearance for about eight months longer. He was then taken suddenly ill with convulsions and hemorrhages from various parts of his body, and died in a couple of weeks. No autopsy was allowed, but all the symptoms were decidedly those of the small contracted kidney. In this case, the retinal trouble was therefore the only, and yet a very decided symptom, that led to the diagnosis of Bright's disease before his illness; and the almost total absence of albumen and casts at first, would indicate that great care should be taken in examining suspected urine, before we pronounce it free from trouble.

INTRAOCULAR CIRCULATION: RHYTHMICAL CHANGES IN THE VENOUS PULSE OF THE OPTIC DISK.

By Dr. O. F. Wadsworth and Dr. J. J. Putnam, of Boston.

The investigation to be described in this paper was undertaken by us originally for the purpose of studying for ourselves the effects of compression of the veins and arteries of the neck and of inhalation of amyl nitrite on the retinal circulation. It is published, however, mainly for the sake of the observations whose nature is indicated in the title of the paper, and our results as regards the other points, which have so often been the subject of controversy, will be only briefly noted.

The method of experimentation was always the same—one of us always examining, by the upright method, the same eye of the other, the pupil fully dilated with atropine. To further fix the appearances, a careful sketch of the disk and vessels was made.

It was soon found that the best point on which to fix attention was a main branch of the vena centralis, which pulsated distinctly as it turned to plunge into the physiological depression near the centre of the disk, receiving at its bend a smaller branch, which also pulsated. Changes in the size and shape of the pulsating portion of these vessels formed the most obvious, indeed the only reliable signs of variation in the vascular supply to the fundus. No *pulsation* was ever seen in the other veins of the fundus, and only during the experiments with amyl nitrite were any changes in their size observed. At no time could any general change in the coloration of the disk be made out.

1. *Compression of the jugular veins.* This was done by twisting a handkerchief about the neck. The compression could easily be carried so far as to cause the veins to stand out in relief on the forehead, and the whole face to assume a dusky hue, not to speak of causing blurred vision and an uncomfortable sense of fulness in the head. The effect of this procedure on the intraocular circulation was, however, so slight, if there was indeed any, as not to be made out with certainty. Sometimes an appearance of greater fulness of the vein at the pulsating point seemed to be present, but the pulsations went on as before.

2. The effects of *pressure on the carotid* of the same side with the eye examined, were studied in the following manner: the pressure was made at about one and a half inches above the clavicle by one finger of the examiner, and was increased to a degree sufficient both to stop the beating of the temporal artery, and to cause a distinct sensation in the head, quite different, it may be said, from that due to compression of the jugular veins. So soon as this result was produced, all pulsation in the veins ceased abruptly, and the vein remained narrow, as in the condition of so-called venous systole, so long as the pressure was kept up.

Immediately on relaxation of the pressure on the carotid the veins refilled completely, and the normal pulsation was re-established.

This observation seemed to us to have an important bearing on the theory of the venous pulse. It is well known that two prominent theories with regard to this phenomenon are held: one, that of Coccius, who maintained that at the time of arterial diastole the blood flowed out of the eye, through the veins, more rapidly than before, the veins at the same time becoming narrower near their point of exit; the other that of Donders, according to which, at the time of arterial diastole, the vein at its point of exit is compressed, which causes a backing-up of the blood just behind this point.

The latter view is the one which appears supported by the results of the experiments just described. Here the pressure on the carotid prevented the arterial diastole, and so long as the pressure was kept up, that part of the vein which normally pulsated remained in a semi-collapsed condition, *i. e.*, in the condition of so-called venous systole. So soon, however, as the pressure was removed, and the heart's impulse again allowed to distend the artery, this portion of the vein refilled, entering into the condition of venous diastole, and then the pulsation went on as before.

3. *Inhalation of amyl nitrite.*—The first result of two or three full inhalations of this drug, poured upon a handkerchief, was that at once, even before the full sensorial effect had developed itself, the vein at the pulsating point became reduced in size as it had done when pressure was made on the carotid; the pulsation did not however, as in that case, cease altogether, but became rapid and sometimes imperceptible, always slight. No change could be detected in the appearance of the arteries at this stage, nor of the veins except at the point referred to.

As a secondary result of the inhalation, which made its appearance just about the time that the sensorial symptoms began to abate, the

vein refilled at the pulsating point, the pulsations becoming again more manifest. A more exact account of the condition of the vein at this period will be given after the description of the rhythmical changes alluded to at the outset of this paper.

4. *Rhythmical changes in the venous pulse.*—When the portion of the veins above referred to was attentively watched, it was seen that, besides the changes which have been recognized as constituting the venous pulse, there were other periodical variations in the size of the pulsating portion of the vessel. These latter occurred at intervals which by their length recall the rhythmical changes in arterial tension described by Traube, Hering, Cyon, and Sigmund Meyer, and which perhaps are the cause of the long waves of movement of the brain noticed by Mosso and others, including one of ourselves.

In other words, besides pulsating in the usual manner, the vein, at the point alluded to, was seen to dilate and contract gradually in periods corresponding to about five respirations. The vein thus seemed to be pulsating under the influence of two distinct systems of waves, one synchronous with the cardiac impulses, the other, the long waves, due perhaps to changes in arterial tension. Under the influence of these long waves the diameter of the vein varied, independently of the ordinary pulsations, often as much as in the proportion of two to one. While such a wave was at its height, each ordinary pulsation seemed to diminish the diameter of the vein by about one-half, whereas at the lowest point of the wave, the ordinary pulsations almost obliterated the calibre of the vein. The passage from the highest to the lowest point of these long waves was gradual and pretty regular, though not absolutely so, the period of each wave occupying, as has been said, the time of about five respirations. These waves were to be made out at every examination when carefully sought for, but were not always equally marked.*

To recur now to the condition of the circulation during the second stage of the amyl experiments, when, as was said, the vein refilled as the subjective symptoms began to diminish in intensity.

It was noted that after refilling, the vein remained for a few seconds persistently distended to the size which it usually had at the

* Dr. Wadsworth has since observed this phenomenon in several other cases, in fact, wherever it has been sought for, provided the pupil was of fair size, the media clear, and there was a well-marked venous pulse. It is not, however, intended to assert by this that the phenomenon must always be present under such circumstances.

height of the long waves, the cardiac pulsations continuing, however, and then the long waves again began to show themselves.

In the first two experiments with amyl nitrite, the period of inhalation was short, and it occurred to us as a possibility, that the coincidence of the secondary filling of the vein with the passing off of the subjective symptoms might be only accidental. To determine this point, the inhalation was repeated and continued a much longer time than before.

In this instance also the vein remained narrowed so long as the effect of the drug was kept up, and again refilled as the subjective symptoms diminished. During this last experiment it did appear as if there were some slight increased fulness of all the veins of the retina, but it was at most of trifling amount. No change in the general color of the disk was observed in this or any other experiment.

Note.—Since this paper was written, we have made observations as to the effect of amyl nitrite on two separate occasions. In the main the results agreed with those above described, but as there was a variation from those results in some minor points, it may be well to mention them here.

During both these latter observations the rate of pulse of the individual inhaling was noted every five seconds by a third person, Dr. Garland, who also noted down the time at which changes in the character of the pulsations of the retinal vein were observed to occur, the time at which the full effect of the drug was felt by the inhaler, and the time at which the inhaler noticed that the effect began to diminish. It is not our desire to give here all these details, which must of course vary, even in the same individual, with the rapidity, amount, and length of the inhalation, but only to refer to the effect on the pulsation of the retinal vein.

In each experiment a capsule sold as containing ten minims of amyl nitrite was broken in a handkerchief, and from four to six full inhalations taken through both nose and mouth.

On both occasions, coincident or nearly so with the first free inhalation, the vein was observed to assume the condition which we have called that of venous systole, and it continued in this condition for about a minute. Then it changed rapidly to the condition of venous diastole, and remained in this state for one and a half to two minutes. During both these periods no variation in size due to either the long or the short waves could be observed. At the end of the second period both systems of waves began to be evident, but it was still

nearly a minute before the pulsations had returned to a regularity and extent approximating that observed before the inhalation was begun. It may also be stated that the time at which the vein changed from the condition of systole to that of diastole, was, in our observation, almost exactly the same; in the other, some ten seconds earlier than that at which the inhaler noticed beginning diminution of subjective symptoms. This discrepancy is hardly to be regarded as of importance in consideration of the difficulty the inhaler experienced in telling *exactly* when the decrease of subjective symptoms began.

CASES OF OPHTHALMIC DISEASE IN WHICH ENFORCED EXPOSURE OF THE EYES TO LIGHT AND AIR WAS SALUTARY. By Dr. C. R. Agnew, New York.

It is often a nice question in ophthalmic therapeutics whether the sensitiveness of an eye to light and air is to be indulged or resisted, and at what point in the progress of treatment exposure to light and air must be insisted upon, even though the apparent immediate effect may be to induce photophobia, lachrymation, or other indications of suffering. The following cases may, in unfolding the subject, serve as a basis for some safe and useful practical deductions. It is in this hope that we give them to the Society.

The first case is one of phlyctenular keratitis in a girl six years of age. The child had always lived in a salubrious mountain district, and had had fair health. The mother stated that there was scrofula in the blood on the father's side. The eyes had been inflamed for some weeks before they came under our observation, and during that period were constantly closed. For more than two weeks the extreme photophobia had caused the child to be confined in a dark room and to bury her face in a pillow, both during sleep and when awake. Under these circumstances the child was brought to New York to be under our care. The photophobia was now so extreme that even the most imperfect examination of the parts was difficult,

and accompanied by violent spasm of the orbicular muscles and paroxysms of sneezing.

It was ascertained, however, that there were small superficial ulcers upon both corneæ, with delicate vessels starting from the coronæ, and slight circumcorneal injection.

Well lighted and airy rooms were got for the patient at a high level in a good hotel. A good dietary, including milk, fruit, and a moderate amount of beef, was prescribed. The amount of exercise and exposure to light was restricted, and attention was paid to bathing and every other sanitary need. The eyes were treated locally with atropia, levigated calomel, and water-baths at the most agreeable temperature. Iron and cod-liver oil were given internally, and at night the entire surface of the body was rubbed to a glow and anointed with vaseline. The child improved in color and general condition, but not so the eyes; they remained unchanged. A double canthotomy was accordingly done, under ether, hoping thus to relieve the extreme spasm of the orbicular muscles. The general tonic course was continued after this for a period of seven weeks, without any appreciable amelioration of the state of the eyes. Much exercise in the light was simply impossible, as the child, when taken to the streets or park, except at night, would resist with loud crying. The eyelids continued to be, as they had been, swollen and red, and every attempt to inspect the eyes was resisted and provocative of a gush of acrid tears and persistent paroxysms of sneezing. When the lids were forcibly opened, the eyes, although not extremely red, were moderately so, and the general surface of the scleral conjunctiva and cornea had a soaked look. All the appearances impressed an observer with the idea that the repair of the diseased surfaces was prevented by the perpetual soaking of those surfaces by the excessive and altered secretions, and that the leading indication was to open the eyelids forcibly.

On the 30th of March, to meet this indication, the child was placed under ether in a well-lighted room. First one eye and then the other was forcibly opened with a spring speculum. The eyes were thus, for a moment or two, exposed to the light and air, until the corneal surface began to look slightly dry, and the excessive secretions were carefully removed from the cul-de-sac with a soft linen rag. These proceedings were repeated several times in the case of each eye for about fifteen minutes in all. When the full flood of diffused light entered each eye as it was held open, it was observed that some resistance was made by the child, although at

other moments the anæsthesia seemed to be complete. The treatment was repeated on the next day, the 31st inst., and again on the 3d, 5th, 7th, 9th, and 11th of April, in all seven times, and in every instance with the effect of lessening the intensity of the photophobia and orbicular spasm. On the evening of the 9th inst., after the sixth application of the method, the child, for the first time in nearly three months, voluntarily opened her eyes. On the 10th she was still able to open them. On the 11th the effect of the ether was prolonged, although the quantity used was not greater than on previous occasions, and there was much vomiting during the afternoon and evening, and also the next morning after breakfast. On the 13th inst. the eyes were widely opened, the corneal abrasions healed, the conjunctival congestion almost all gone, and the photophobia and lachrymation not annoying. In a few days the patient went away well, and on inquiry some months later was reported as being still so. Dr. Webster saw the child a year afterwards and reports that she was still well.

It is, we think, fair to suppose that the main agency in the cure was the forcible exposure of the badly nourished eye tissues to the action of light and air. The influx of light and contact of air would naturally awaken the dormant or perverted energies of the tissues, and quicken the reparative action. It may be said that the repeated effect of the ether would tend to neutralize morbid sensibility and harmonize the reparative forces. We are aware of the possibility of such an agency, and would not exclude it entirely in this case. Indeed, we have often seen, in cases of phlyctenular disease, where extreme photophobia had induced the use of an anæsthetic to facilitate the examination of the offending eye, the distressing symptoms greatly lessened on the recovery of the patient from the anæsthesia. But in this case the patient had had ether employed and a canthotomy done without benefit, and subsequently got well as described.

Moreover, in other instances, in older subjects, we have tried the method of forcible exposure, without the intervention of an anæsthetic, and with good effect enough to make us trust it in otherwise incorrigible cases. The following case, although not retained to its end, may illustrate our meaning: O. B., seventeen, was hit in the eye with an apple-core in 1874. Superficial inflammation ensued, which ran into double trachoma and panniform keratitis. He had had all the benefit of treatment by various skilful hands, and ran the gauntlet of those who had advised multiform nostrums. He came under our observation March 26, 1878. His photophobia was extreme, and

it was almost impossible to inspect the eyes on account of violent and prolonged paroxysms of sneezing which agitated his head and entire body whenever the lids were forcibly opened to admit light. The patient was etiolated and very feeble by continuous incarceration in the darkened room of a tenement-house. When the attempt was made by digital pressure to antagonize the orbicular muscles and open the eyes, every muscle in the face and neck seemed to resist, and his mouth would open widely in the general grimace. In this case we used the method of forcibly opening the eyelids with the spring speculum and without any anæsthetic. We placed the patient erect with his back against the wall, and facing a north window, and introduced the speculum into one eye at a time, and kept it clamped in place, widely distended, while the patient slowly counted one hundred, we having observed that that marked the limit of his endurance. The act of counting diverted his mind and consumed five minutes. We then did the same with the fellow-eye. In placing the speculum, care was taken to open it as widely as possible and then to clamp it, so as to distend the palpebral slit to its utmost. The effect of this treatment was so marked and immediate that the patient soon left the office able to open his eyes partially, and returned on the following day with both eyes more widely opened, and so tolerant of manipulation and light as to make an inspection relatively easy. Again the speculum was introduced as before, and the palpebral slit distended. The improvement went on continuously during the few days that this patient was under treatment, but the pannus and the old opacities darkened the prognosis, and he soon failed to reappear.*

We might adduce other cases of this class, but enough have been given to impress the lesson that because light produces distressing symptoms in certain eye cases we are not, therefore, to indulge the patient in his desire to live in the dark or to multiply eye-shades; but, on the contrary, to resort to active measures, which, on superficial observation, might seem to be opposed to the indications of treatment. Many so-called indications remind one of the sign-board at a cross-roads, which, having been blown down in the night, was replaced so that its directions were exactly wrong. We must test indications by most careful deduction, to which all the phenomena drawn from many related cases yield their true logical value.

While transcribing the last case, a case of extremely irritable, non-specific, interstitial keratitis in an adult came under observation, in

* Seen some months later and condition of the eyes vastly improved.

which out-of-door life, foot exercise, a daily air-bath with friction with the hair mittens, and a Turkish bath every other day, inaugurated a new action and led to reparative changes. In this case there had been acne and a tendency to lay up loose, flabby flesh.

The following case, which had been kept in the dark for nearly *nine years*, will illustrate the danger of not translating correctly the indications for treatment. H. B., 21, was first seen by us in his home in a distant part of the State. We reached his house in the afternoon and were shown into a darkened hall, and thence escorted through a darkened ante-room into the dark chamber in which the expectant patient was incarcerated. Screens and window-shades, and outside blinds had been so cunningly arranged that our limp patient with the moist, flabby hand was invisible until we insisted upon having the light of a dim candle. The history of the case was as follows. Nearly nine years ago, after reading steadily for three hours, he suddenly felt a sense of numbness and formication around the eyes and in the forehead between the supra-orbital nerves, and lost the power of fixing his eyes steadily even on large objects. Photophobia soon supervened, "amounting almost to agony." He betook himself to a dark room, in which he remained continuously for nineteen months. He then was taken, with eyes so covered as to exclude light, to a distant town, where he was treated for some months "for paralysis of the optic nerves." He grew worse under this treatment, and therefore returned home and to the dark room, in which he remained for the remainder of the period of nine years, only going out occasionally, and then after dark, and always with the precaution of a shade of some kind to exclude moon or star light.

It was obvious that the habits of years could not be changed in a domicile in which almost every device suggested by tender solicitude for the sufferer was, in our opinion, working against the cure. We accordingly suggested his removal to the Manhattan Hospital, New York, which was accomplished on November 1, 1873. He was brought to the hospital with his eyes so covered by black bandages as to exclude every ray of light. These were removed in spite of fervent protests. The vision was then tested under as much light as he would bear, which was, however, of a degree making reading for the normal eye difficult. It was found that he could read Snellen No. 6½ at eight inches. It was with great difficulty that he could be persuaded to fix his eyes on any object. The effort to do so caused them to roll about in the orbits, and his head to nod and jerk backward and forward. He would throw his arms about in an aimless

manner, and exhibit in various other ways the want of self-control. We could not classify the symptoms with chorea. He was blanched in color, through long seclusion from light, and greatly emaciated. A few days after his admission we made an ophthalmoscopic examination, and found that he was myopic, and that there was slight neuro-choroidal hyperæmia. As regards the latter phenomenon we were by no means certain, however.

The treatment consisted in gradually increasing the exposure of the eyes to light, for which specific directions were given daily, and a course of simple calisthenic exercise and stated out-of-door walks. We broke up at once the habit of depending upon others for every want, and on one occasion, having taken him a little distance from the hospital, suddenly left him to find his way back alone. It was interesting to observe how, in a child-like manner, he regained the ability to wait upon himself, having lost the art so thoroughly by nine years of dependence upon others, though by no means deficient in intellect.

Nov. 17th.—The vision for the distance was tried and found to be $\frac{20}{70}$ with $-\frac{1}{16}$. He was then put upon a course of hypodermic injections of nitrate of strychnia.

Dec. 22, 1873.—Vision $\frac{20}{50}$ with $-\frac{1}{30}$. He was now sent home, with specific instructions to live in the open air and to expose himself to sunlight. Shortly after leaving the hospital *psoriasis* broke out on his forehead, covered the scalp, and spread on to the neck, and was so inveterate as to compel him to return to the city for treatment.

In November, 1874, the date of the last notes in his case, the vision was as follows: Right, without glass, V. $= \frac{20}{200}$; with $-\frac{1}{30}$, V. $\frac{20}{30}$. Left, without glass, V. $= \frac{20}{200}$; with, $-\frac{1}{20}$; V. $= \frac{20}{30}$. The eyes were no longer sensitive to light or in any way troublesome.

Some years previously to our seeing this case we had seen another case almost the fac-simile of it, both as regards history and recovery. That was in the person of a young man from Vermont, who had been incarcerated in the dark for more than eight years for an eye affection in which photophobia was the ruling symptom. In that case not only had the general health been profoundly depressed, but epilepsy had been superinduced. In that case also the main element in the treatment which we employed was the use of light, with regular exercise to quicken tissue-change and tissue-building. Formerly it was the almost universal practice to immure patients in the dark, not only for affections in which photophobia was a symptom, but for any eye dis-

ease or injury, irrespective of the effect of light. The exclusion of light necessarily involved also the exclusion of air, and as the sufferer was ordinarily confined to the same room by day and by night, and not unfrequently with a number of other victims, an unsanitary state was produced, the odor of which is quick in our memory to this day. That entity compounded of body odor and darkness has never ceased to be repulsive or to impress its lesson upon us, and yet we can look back with the conviction that we also have been too prone to exclude light in the treatment of our patients. We may adduce the change which has occurred in our treatment of cataract cases. We can easily recall the time when we shut our patients in darkened rooms, after cataract extractions, for a period varying from one to five or six weeks, with only occasional introduction of daylight. Now, we never shut them in the dark. The instructions are to have the apartment light enough for the attendant to see to read ordinary print, while we exclude light from the patient's eyes by means of a black shade or darkened coquilles so long as entire rest of the wounded organ may be essential to the cure, watching carefully for the earliest moment at which the use of light as a remedy may be adopted. By this method the patient lives in an atmosphere so illuminated as to be conducive to general nutrition and to the uniform practice of a hygienic regimen. The quality of the nursing is always better when light pervades the sick-room. The attendants are more cheerful, and more exact in all their manipulations. Specific directions given by the surgeon will ensure the coaptation of the black silk mask over the eyes, or the use of the dark coquilles, and make any sudden exposure of the eyes themselves to the light improbable.

It may be said that we cannot safely deduce from such cases rules to be applied in the treatment of other cases in which photophobia exists, or in which rest of the organ of vision is naturally demanded. This leads us to ask the questions whether light should *ever* be entirely excluded from the room in which an ophthalmic case is, and if so, under what conditions, and whether it is not better to use contrivances to exclude light from the eyes, while it is allowed to pervade, with its life-giving power, the atmosphere in which the patient is kept?

These questions involve the sanitary construction and management of ophthalmic wards. In answering these questions we would say emphatically that we would not shut a patient in a dark room except when nature provides the way at night, or for such other and brief periods during the day as might be agreeable for sleep or entire quiet,

or for the temporary application of iced or other dressings incompatible with the use of the black silk eye-mask or coquilles.

In cases of retinal, neural, or choroidal disease, in which local bloodletting should be immediately followed by absolute exclusion of light from the eyes for a period varying from twenty-four to thirty-six hours, the use of the black silk mask carefully adjusted meets the indication fully, and having been applied securely by the surgeon, is less likely to be so displaced as to admit light than window-screens to which incautious persons have access.

The value of the local method of excluding light is very great in all those forms of cachexia, like gout, rheumatism, syphilis, and scrofula, in which we have to use every sanitary resource to cure the patient, to lessen the amount of local damage, or to diminish the tendency to recurrence of the local disease.

The inducement to shut a patient in the dark in iritis, for instance, is almost irresistible. The nature of the tissues primarily involved, the importance of such related parts as the crystalline lens, the ciliary organs, and the choroid, seem to make it the imperative duty of the surgeon to put his patient in the dark and to keep him there until he is well. We are bound to say, that in our experience, ambulant patients with acute iritis get well with as few permanent lesions as any other class, and in less time. This fact was early forced upon our attention by observing the results of practice in dispensary patients, as contrasted with those of patients in the walks of life in which every element of rest and seclusion and medical attendance in domicile could be commanded. To our surprise, the poor man, exposed to many hardships, would get well quickly, while the more luxurious patient would linger, and perhaps suffer more and have more relapses.

Atropia, Turkish baths, and Mercury are the cardinal remedies in iritis, and the first-named can never be safely omitted. Over and over again we have seen patients with acute iritis far on to convalescence within a week after beginning such a plan of treatment, and without any other precaution against exposure to light than would be afforded by a pair of smoke-colored coquilles, medium shade. It may not be considered a useless digression if we say here that we always use a solution of sulphate of atropia at least four grains to the ounce, and apply it every ten minutes for six or eight consecutive times before we allow the patient to go from observation, and order an immediate Turkish bath. We have frequently seen a pupil dilated fully after a Turkish bath, which had previously yielded little, if at all. Where such baths are not to be had, their effect may be imitated by

any method which produces free sweating and is accompanied by shampooing of the head.

As we have seen, a few hours of improper incarceration in a dark room may give a character to a case which will deceive both patient and physician as regards the true indications. We cannot be too much alive as to the danger our patients are in of forming habits which, although apparently essential to recovery, or to any degree of comfort even, are directly in the way of a possibility of cure.

As an illustration of this principle, we adduce another case in addition to those already given.

Some time ago we were called in to see a lady of middle age, who for many months had been confined to a dark room. Not being well, and being of a very nervous temperament, she had become alarmed when her eyes, which had previously been strong and useful for all purposes of vision, began to be defective in endurance and to grow morbidly sensitive to exposure to ordinary use and common light. Instead of throwing off some of the enervating appliances of luxury, she gradually ceased from exercise, and as she grew weaker, spent more and more time in bed. Day after day she shut the light and air more and more from her apartment, until when we called she was existing in a room which was as hermetically sealed against light and air as a room with two large windows and three doors could be. There were at the windows outside blinds, inside shutters, and hanging curtains. All the doors except one were closed, locked, and their marginal cracks and key-holes stuffed with cotton. The door by which access was had to the chamber was at the end of a double-door hall and leading out of an adjoining room, which was kept dark. It was difficult to persuade either the attendants or the patient that so small a light as a candle would be tolerable. A candle was got, however, and after great difficulty an examination made. We could find no organic disease of the eyes, nor any spinal or cerebral malady to account for the extreme hyperæsthesia. The main cause of the aggravated symptoms seemed to be a yielding on the part of the patient to the photophobia until all power to resist it was in abeyance, and nothing could come in to act as a curative except the firm will of the medical attendant subverting the entire method of treatment previously employed. In a very few hours we had the patient moved into a clean, dimly lighted room, and the chamber from which she had been extricated, sunned, ventilated, and scrubbed, processes to which it had not been subjected for several months.

We are prepared then to say, in summing up our experience, that daylight should not be excluded from apartments in which ophthalmic cases are being treated. That it will be frequently necessary to oppose vigorously the tendency of a patient to dwell in the dark. That, as a rule, the importance of and necessity for the use of light as a remedial agent will be in inverse proportion to the inclination of the patient. That we cannot always depend upon the presence of photophobia as an indication for the prolonged use of darkness as a remedy. That photophobia is not usually a very marked symptom in retinal, neural, or choroidal cases in which the interrupted use even of darkness as a remedy is demanded, but that the ophthalmoscopic lesions are more to be depended upon as guides. That, as a rule, corneal and iritic affections do not demand the entire or continuous exclusion of light, and that many cases of those diseases are either aggravated or made hopeless by such exclusion, and especially when they are not traumatic, but the offspring of some diathesis or cachexia. That under the latter circumstances every hygienic and therapeutic consideration is opposed to the exclusion of light. We recall, in writing this sentence, a case of syphilitic iritis to which we were called in consultation, where the patient had been kept for three months in the dark, and during most of that time under the full effects of mercury, without saving his eyes, and with the result of a bankrupt constitution. We will not soon forget the wretched appearance of the victim as we let the light of day upon his blanched face, and saw the drooling of saliva from his flabby lips.

We believe that it is better to depend upon some opaque covering for the eyes when partial or complete darkness is to be used as a remedy, and not to exclude light from the apartment, and by such exclusion to lessen ventilation and induce etiolation.

Scarcely a day passes in our practice in which we do not see one or more cases where damage has been done, and often of an irreparable nature, not only to the general health, but also to the diseased eyes, by methods the opposite of those which we are striving to commend to your favor.

PHOTOPSY FROM AN INJURED EYE, PERSISTING SIX MONTHS AFTER ENUCLEATION. By Dr. J. J. B. Vermyne, New Bedford, Mass.

Mr. F. Tr., 53 years old, stonecutter, while engaged at his trade, received an injury of his left eye. This happened during the latter part of August, 1876. He was aware of the entrance of a foreign body in the eye—whether a piece of iron or a piece of stone—by a sudden, dull pain and an appearance as a large red ball before the eye, which was soon found to be entirely blind. There was severe conjunctivitis of the bulbus during a few days, but this and the pain gradually subsided under continued application of cold water, while at the same time the vision seemed to improve. This improvement, however, ceased very soon, and he found that the eye was growing blind, for which he came to consult me on September 26th, nearly one month after the injury. He is a strongly built man, has always been temperate in his habits, and with the exception of a slight rheumatic affection, has never had any sickness. He has received frequent injuries to the eyes from the presence of foreign bodies, but they could always be easily removed and never left any trace. There was no redness ; the cornea showed a small scar very near the margin on temporal side, otherwise clear. Iris same color as other eye ; has a little below the horizontal meridian, and slightly inward and upward of the corneal opacity, a separation in its continuity in the form of a rent nearly one line in length, encroaching neither upon the pupillary or ciliary margin. Corresponding in direction with this rent is a posterior synechia of the iris. The lens is cataractous, more dense on the temporal side, in the immediate neighborhood of the synechia, less in the centre, and but very slightly on the nasal side, where fingers are counted at about two feet distance. Examination with the ophthalmoscope after instillation of atropia shows only the one synechia above mentioned, light reflex from the fundus through the rent in the iris-tissue, faint reflex from the fundus oculi through pupil, except at the nasal side ; but even there no details of the fundus could be seen. There is not the slightest pain, his only complaint being the loss of vision. With the almost indubitable presence of a foreign body within the eye, and the impossibility of an

exact location, I advised enucleation of the injured eye, which was refused. After explaining, however, the danger to the other eye from sympathetic ophthalmia, he promised to submit to the operation as soon as his right eye should indicate the slightest trouble, or when inflammatory symptoms should appear in the injured eye. I thought of the possible chance that the foreign body, which, according to the direction of the corneal and iris wound, had penetrated in a slightly oblique direction, might be held in the lens, and of a removal of both by cataract operation, and therefore was perfectly willing to postpone enucleation. The patient went to work again, and had no trouble until the end of December, 1876; the opacity of the lens was meanwhile increasing. At the time mentioned, being at work in the cemetery on a cold day laying curbstones, he was attacked by rheumatic pains, which, after a couple of days, seemed to localize more in the head, especially in the supraorbital region, and were accompanied with scintillations from the left eye, appearing in the form of a red smoke, as from a distant fire, as soon as he closed his eyes for sleep. The frequency and duration of these perceptions varied very much; usually, however, they were severe enough to rob him of any refreshing sleep. To the different means employed, hirudines at tempora, blisters, morphine internally and hypodermically, bromide of potassium, iron and quinine, hydras choralis, etc., there was an occasional response with temporary relief, but soon they had to be given up, as not producing any lasting benefit. Both the pain and the photopsy gradually increased; the pain, extending first over the temporal region and then farther backward, until the whole head was affected, was almost continuous, with nightly exacerbations. The photopsy assumed the form of strong flashes of light darting out of the eye, to a length of from 5 to 6 inches, making their appearance every night when he tried to go to sleep, occasionally in day-time. When the photopsy was at its worst he often imagined hearing a hissing sound accompanying the flash. During all this time there was never any redness of the eye, nor sensitiveness on pressure in the ciliary region; and the uninjured eye, although repeatedly examined functionally and ophthalmoscopically, never showed the slightest trouble, although at the worst stages of his suffering he thought that occasionally a flash of light would dart out of that eye too. I was at a loss to explain these severe symptoms. When they first made their appearance there was considerable swelling of the cataractous lens; but after some time not only the swelling subsided, but absorption of the cataract took place, without any abatement in the other symptoms. At last

there was only a very slight webby opacity left in the pupil, a little more dense in its lower part. With the ophthalmoscope light reflex was not only obtained from the fundus, but here and there some of the details became visible in some detached parts of the retinal blood-vessels. A clear view of the fundus could never be obtained on account of a large number of thick floating opacities in the vitreous. Vision began to show again to the amount of $\frac{15}{100}$. Sometimes I suspected that I could see the foreign body, but I never felt sure enough to locate it. Again I supposed that the foreign body might not be imbedded, but free in the posterior chamber, and that with the watery condition of the vitreous, evident from the rapid and multiple movements of the opacities in that body, the foreign body might change its place, and impinge directly upon the optic disk when he tried to lie down for sleep. I therefore advised sleep in a more or less sitting position, but of no avail. The trouble appeared just the same then as before. Finally, fearing that death from exhaustion, or insanity would follow as a result of this continued suffering, but with great misgivings that the trouble might no longer be local, but central, at the patient's earnest request I enucleated the left, injured eye on January 26th of this year, nearly 17 months after the injury. Fully $\frac{1}{4}$ inch of the trunk of the optic nerve was removed with the eyeball. The section of the nerve appeared normal. On opening the eye the vitreous was found very fluid, and in the retina, about one optic disk distance toward the nasal side, was found a piece of iron, about one line in length and half a line broad and thick, with one edge a little sharper than the other, however, so loosely imbedded in the tissues, that it falls out of itself, showing a slight unevenness in the place where it had lodged. The result of the operation showed that my misgivings were not without cause. For although the pain and photopsy have somewhat diminished, at this moment, six months after enucleation, they still persist. The same remedies as before enucleation were also resorted to after this operation, in addition to Fowler's solution, ergot, and iodide of potassium, but without any more effect than before. A careful regulation of his diet, and iron and quinine persistently exhibited for quite a long time, have improved his physical appearance, and this, with the fact that I tried to reassure him that the photopsy would slowly disappear when his general health should improve, has probably contributed greatly to the decrease of the nervous excitement he was laboring under before the operation. But there is still pain in the region of the ophthalmic branch of the trigeminus, and in that of the auricularis and occipitalis, with occa-

sional rheumatic pains in the limbs, increasing with the slightest cold or exposure. The photopsy is also present, though the flashes are not quite so severe; they are not so extensive or so bright, do not last so long as before, so that since a couple of months he can obtain sleep without any artificial means. The flashes are now always unilateral on the side of the enucleated eye. The vision of the right eye is perfectly normal. The conjunctival sac of the enucleated eye has a perfectly healthy appearance, and pressure with a probe-point on different parts of this membrane does not produce any pain or photopsy. The neuralgic pains still continue to show their nightly exacerbations.

I have been unable to account with certainty for the relations between the probable occasioning cause of the trouble, the foreign body within the eye, and the subsequent nervous symptoms. Although the foreign body itself could not be seen, yet its retention within the eyeball could be suspected by tracing its path through cornea, iris, and lens. For this reason I was afraid of the danger of sympathetic ophthalmia, and of this I gave due warning. But I was not prepared for the symptoms as appearing in our case, especially with such severity, and yet without any complaint of pain in the eyeball, nor the slightest redness or other visible symptoms of inflammation of the eye; neither was I able to obtain much information in the works on ophthalmic and nervous diseases at my command. The only notices on photopsy bearing to some extent upon the subject were in Wharton Jones, 3d American edition, page 300: "Analogous appearances of fiery scintillations, flashes of light, and colored coruscations, occuring spontaneously, are symptoms of irritation or excitement of the optic nervous apparatus—cerebral or ocular—from inflammatory congestion of the choroid, as above mentioned, rather than from inflammatory congestion of the retina. As such inflammatory congestion may end in amaurosis, so the luminous and colored spectra are symptoms of incipient amaurosis. They may continue to appear, however, after all visual sensibility is lost." Leber, in *Graefe-Saemisch Handbuch der gesammten Augenheilkunde*, Vol. V., p. 1046, says that "photopsy can be caused by increased filling of the blood-vessels, inflammation or unknown disturbances of the nervous system, as internal cause of irritation, or by much coarser, mechanical influences, dragging or compression by shrinking masses of connective tissue, calcification, etc.;" and a little farther: "also by compression of the optic nerve from masses of connective tissue in the process of shrinking after injury or after contusion of the stump in enucleation. In

some cases this photopsy can become so intense as to produce hallucinations, so that it may cause anxiety for the mind or life. As a rule, they are entirely removed by enucleation of the bulbus or resection of the optic nerve stump." Stellwag v. Carion, page 850, mentions the fact of photopsy continuing after complete amaurosis has set in, and in speaking of causes says, that optic hyperæsthesia appears as a symptom of congestive or inflammatory brain disease, delirium potatorum, narcotic poisoning, neuralgia of the trigeminus (Alexander), etc.

These few points, applied to the case reported, would allow of an explanation of the persistency of photopsy in two ways: the first cause was either intraocular, the foreign body within the eye, or the symptom depended upon an affection of the trigeminus, and might have been favored by the presence of that foreign body.

In regard to the first explanation, it could be presumed that the pressure of the foreign body upon the choroid, as stated by Wharton Jones, was the first cause of the photopsy. Although at no time while the patient was under my observation, a period of sixteen months before enucleation, could any symptoms of active inflammation be observed, yet some disease of the choroid might be suspected from the watery condition of the vitreous humor and the numerous large opacities within that body. The persistency of the symptom after enucleation might depend upon the same intrinsic action of the brain, by which strong and lasting visual impressions are so forcibly implanted in the apparatus of vision, that their after-images are either continually present in the field of vision, or at least make their appearance as soon as the patient begins to think of them. This latter condition might be highly increased by the great excitability of the central nerve system, from pain, sleeplessness, and especially from the anxiety caused by being conscious of the presence of some foreign body and the possible dangers it might bring. That such an excitable condition existed in reality is proved by the existence of aural illusion, in the form of the hissing sound accompanying the flashes of light, when they were the worst. In favor of this explanation are the facts that there never was any trouble before the eye was injured, that the impressions were at first entirely, later chiefly unilateral, and that, although by no means removed by the removal of the foreign body, they are decidedly less severe than before.

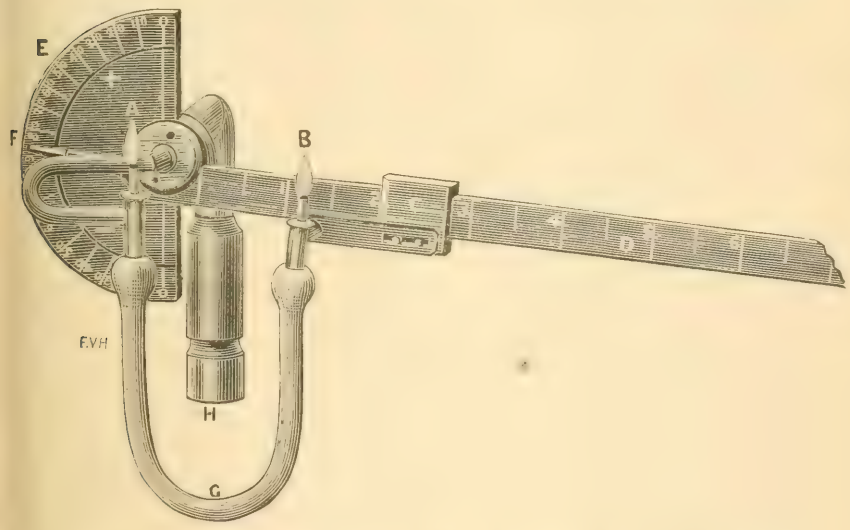
The second opinion would rest especially on the fact of this appearance after exposure, simultaneously, or almost so, with pains in

the region of the ramus ophthalmicus of the trigeminus, and of their persistency with the pains after enucleation, while it might be strengthened by the negative evidence of absence of visible irritation in the eye. In connection with the trigeminus affection there could be some local hyperæmia of the meninges at the base of the cranium, and therefrom pressure on some part of the trunk of the n. opticus. The excitability of the cerebral system would work here the same as with the other explanation.

That the persistency of optic hyperæsthesia in this case should depend upon pressure or dragging from shrinking masses of connective tissue I cannot believe, since the section of the nerve, which as a matter of precaution was removed for quite an extent, appeared healthy. In this respect I believe that my patient would readily submit to resection of the stump as advised by Leber, if I could give him the certain promise of relief, which of course I would not dare to do.

A PRACTICAL AND RAPID METHOD, WITH AN INSTRUMENT, FOR THE DIAGNOSIS OF THE REFRACTION. By Wm. Thomson, M.D., Philadelphia.

The method which I have the honor to submit to your notice, and the instrument which I venture to call an Ametrometer, are intended to enable us to recognize promptly the presence of ametropia and determine its degree without the aid of test-types or test-glasses, the empirical use of which is attended by such serious expenditure of time. The full and entire paralysis of the accommodation with atropia is essential in this as in every other exact study of the refraction. The instrument is shown in the woodcut, and consists of



a small fixed gas-jet A, a second one B, attached to a box C, which slides upon a bar D, the jets connected by a flexible rubber tube G; the end of the bar F forms a pointer, which, by elevating or depressing the other end of the bar, can be placed at any part of the graduated half-circle E, which is fixed firmly to the thimble H, by which means the entire instrument can be attached to a common gas-burner, and the lights regulated by its stop-cock. We have here a

portable and simple instrument, giving one fixed light A, and a second B, which can be placed at our pleasure in contact or at any distance from the first, depending on the length of the bar, which is 30 cm., and at any possible angle with it, by moving the bar on a pivot opposite to the light A.

The jets having been lighted and turned down into two small flames about 5 mm. in diameter, the patient, placed 5 metres away, is directed to observe the flames, and to say whether he sees them as small points of light separated, or as diffused, enlarged circles which can be made to come in contact at their margins by sliding movements of the box on the bar, by the hand of the surgeon ; bearing in mind that an emmetropic or corrected ametropic eye will resolve the lights into two until they pass one behind the other and become fused, whilst in ametropia the circles will seem to touch ; whilst a distance, depending upon the degree of ametropia, remains between the small light points. To determine the kind of ametropia, the patient is directed to pass slowly in front of the eye under examination a slip of red glass in such a manner as to color half of each diffused circle, and if the red half seems to be on the same side with the red glass, myopia is recognized, and if on the opposite side, hypermetropia ; this may be as well done by passing before the eye a card or paper in such manner as to exclude from view one-half of each circle.

To determine the degree of ametropia, the bar has been divided on one side into spaces of 2.5 cm. with a half-space between, and on the other into English inch and half-inches, and it will be found that each space of 2.5 cm. will indicate an ametropia of one dioptric, metric system, and each inch $\frac{1}{36}$ of the old system. The cut represents the two flames as apart 2 d., and they would appear to a person having M. or H. of $\frac{1}{2}$ D. or $\frac{1}{36}$ as two circles of light, with their margins in contact at one point, separating on the removal of light B, and overlapping when it is placed nearer to light A.

For those who still prefer the old system to the metric, it must be remembered that the old glasses are not based upon their exact powers of refraction, but are ground on *radii* of Paris inches, and that, owing to the index of refraction of the glass commonly used, they by a happy chance correspond in focal length almost exactly with the English inch ; hence, each inch of distance between the test-lights, as determined by the use of the inch scale on the bar, will indicate an ametropia of very nearly $\frac{1}{36}$; and the higher degrees can be found instantly by dividing 36 by the number of inches between the lights when their margins seem to have come into contact.

When astigmatism is suspected, the patient should be directed to observe whether the flames are longer in one direction than the other, and if so, by the rotation of the bar on a pivot opposite to light A, the two lights being placed some distance apart so that they do not appear to touch, we have one of the most accurate means of ascertaining the meridians of greatest and least refraction, since it will become easy for the patient to say when two elongated points or ovals of light are placed so as to have the same direction; and when this has been fixed, the pointer F will indicate on the half-circle the exact angle at which the lights are placed, and hence the position of the meridian of greatest ametropia.

On bringing the flames into contact at this angle, the real distance of the lights apart will indicate the degree of ametropia, and having thus found one meridian, the lights can be placed at right angles to it and the refraction of the second be ascertained. In difficult cases, or with poor observers, it may be an aid both in simple M. or H. and A. to color one of the flames by placing a slip of red glass in front of it, held by the surgeon.

Some experience in the correction of ametropia enables me to know how convenient it is to have more than one method of examination, and great care has been taken to perfect and simplify the method now proposed, in the hope that it might take the place of a rapid and accurate method of diagnosis, and thus greatly extend the benefits of careful corrections of ametropia.

For obvious reasons, based upon the rationale which follows, a distance of 5 m. between the patient and the instrument has been assumed, but others may be chosen; neither is it at all requisite to have so perfect an instrument, since examinations can be made with wax tapers or other small points of light, or they may be obtained at will from properly chosen reflecting surfaces.

To understand the method proposed, and make the best practical use of it, it must be remembered that an emmetropic eye only when at rest can receive on the sensitive portion of its retina a perfect image of a small light point placed at or beyond 5 m., and that it brings to a perfect focus on its retina rays of light only that are parallel; when the retina lies beyond this point, as in M., or within it as in H., a section of a cone of light must replace the point on the retina; and could the size of this circle of diffusion be measured clinically, the distance from the base of the cone to its apex, whether in front or behind the retina, could be calculated, and hence the degree of M. or H.

To estimate the size of this circle of diffusion the law of *projection* has been invoked, and by the method proposed, the dimensions of one are found by placing two circles on the observer's retina, choosing a fixed known distance between the patient and the test-lights, and measuring the real distance between the lights when their diffused images touch on the patient's retina, and appear to be in contact in space in front of him. Clinically this can be done by this instrument, the theoretical reasons being as follows :

Since all calculations based upon the optical constants of the human eye, composed of two complete and complicated dioptric systems, are and must be difficult to demonstrate, we have the highest authority for these purposes, for adopting the well-known simplified and reduced diagrammatic eye of Prof. Donders, consisting of but one curved surface of 5 mm. radius, a coefficient of refraction of $\frac{4}{3}$, a posterior focus of 20 mm., and anterior focus 15 mm ; since it is conceded that from these cardinal points by calculations we can trace any ray of light, ascertain conjugate foci, estimate the size of retinal images, etc., with confidence that the results will agree with those phenomena which occur in the human eye under like circumstances. As a consequence of clinical and theoretical study with this method, I venture to propose another to the constants of Donders' eye, in the diameter of its pupil, viz., 5 mm.

Fig. 1.—Donders' eye, showing the course of a beam of light arising from a distant point.

Finding within Donders' eye, a fixed quantity in the triangle of 20 mm. radius and 5 mm. sine or arc, we are justified in choosing a second one outside of it for purposes of comparison, and this is afforded by one of 5 m. radius, and arc of 125 cm. Could we regard the sides of the long beam of light in this figure as rigid wires 5 m. long, passed through holes in a metal cornea 5 mm. apart, and brought to an apex 20 mm. from it, we would have the outlines of a mechanical tool, like a pair of pincers, with the long handles without and the jaws within the eye ; it would be evident that any separation of the ends of the wires

anteriorly would put asunder the posterior ends and imitate a circle of retinal diffusion ; also that the wires would either diverge or converge at a distance from the cornea depending on the anterior separation ; hence, any change in the arc of the large angle must produce changes in both angles, and finally that any separation of the two wires at the distant point would resemble the enlargement of a small light as seen by an ametropic eye.

The possibilities as to size of a circle of diffusion when projected, would be any diameter between 5 mm. and 125 cm., since, if the two wires were made to cross at the anterior focus of Donders' eye 15 mm., their distant points would be apart 125 cm. and the two points within the eye would be apart 5 mm. ; the similarity of the large and small angles being assumed as the basis for these hypotheses.

The apparent enlargement of a small distant point of light to an ametrope metaphorically resembles the separation of the two wires anterior to the eye, whilst the divergence at the points within the eye is like the circle of diffusion which falls on the ametrope's retina. The directions of the anterior wires, whether they diverge from the cornea and if continued backwards would meet behind the retina, or converge in front and cross at some point, give us the direction of the rays of light in H. or M., and the distance from the eye to such points of junction would be the *punctum remotum.*

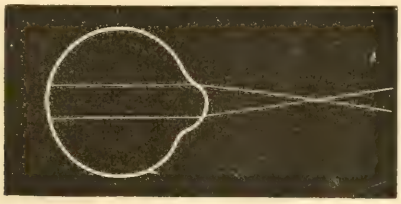


Fig. 2.

The convergence of the wires at a distance of 15 mm., the anterior focus of Donders' eye, resembles a M. of that degree, and would render parallel the jaws within, separate the ends 5 mm., and be attended by a separation of the anterior extremities of 125 cm., vide fig. 2.

Assuming that a small light at 5 m. is focussed on the retina of Donders' eye, let us reason upon the results of a condition of M. artificially produced by a + glass giving a *punctum remotum* of 25 cm. : the image of the light would now be a circle of diffusion, which would diminish as the light point was brought near, and come to a

focus when it reached a distance of 25 cm. or about 10″, and the rays had become divergent. We may now say as 250 mm. the length of the induced radius : 5000 mm. the length of the large radius :: 5 mm., the arc of small angle : the answer, being 100 mm. ; and hence we find by calculation that the circle of diffusion should appear by projection to be 100 mm., or 4″ in diameter. It will also be observed that if an ametropia with *p. r.* of 25 cm. gives rise to a circle of 10 cm., in like manner a *p. r.* of 100 cm. or 1 meter would cause a circle of 2.5 cm., and hence indicate an ametropia of precisely 1. dioptric.

Having thus demonstrated the probable diameter of a diffused circle as projected with an induced known ametropia, we can by reversing the process discover the very essence of ametropia viz., the *punctum remotum* of a myopic or hypermetropic eye by measuring the projected circle of diffusion at the fixed distance of the radius of the large angle, viz., 5 m.

Two lights now become essential, and when their diffused circles seem to be brought in contact, the distance between the lights will give the diameter as projected of either of the circles; and should the distance, for example, be 5 cm., what then is the *punctum remotum*, and hence, the degree of ametropia? We may then say as 50 mm. : 5 mm. :: 5000 mm., and multiplying the second and third terms together and dividing by the first, we find 500 mm. as the *punctum remotum*, and ametropia = 50 cm., or to glass = 2 D., or $\frac{1}{18}$.

It is now evident that this method simply enables a circle of diffusion to be measured clinically, and that a comprehension of Donders' eye gives a simple rule as follows : *Rule.*—Multiply the radius of the large angle by the arc of the small one and divide by the diameter of the circle as found by observation, and the result will be the *punctum remotum* positive + or negative —, and hence the degree of either M. or H., and the power to select glasses + or — spherical or cylindric which will restore the eye to emmetropia.

To permit the use of the English instead of the metric system, the following are the constants of Donders' eye in inches : radius of curvature 0.2″, anterior focus 0.6″, posterior focus 0.8″—and for this method, size of pupil 0.2″, radius of large angle 200″ or $16\frac{2}{3}$ feet, arc 50″. A single case will illustrate the process of reasoning : C. is found to be myopic, and the lights are apart 5″ when their circles touch; we then say 5″ are to 200″, the long radius, as 0.2″ arc small angle to the radius of desired angle. We now multiply 200 by 0.2 = 40.0 and divide by 5″ and we have 8″ as the result, and the *punc-*

tum remotum—or an ametropia to be corrected by $-\frac{1}{8}$, or more accurately $-\frac{1}{7\frac{1}{2}}$ placed $\frac{1}{2}''$ in front of cornea, which glass will render parallel rays which diverge from a point 8″ away.

Since algebraical formulæ are sometimes passed over by the reader without due interpretation, they have been avoided and the process reduced to the more familiar arithmetical law of simple proportion. With either the metric or the inch system the calculation for the glass required is too simple to need a table, since a separation of the test-lights of 2.5 cm. or 1″ will indicate either 1 dioptric or $\frac{1}{36}$.

In using for this demonstration the reduced eye of our great master Donders, we but pay a new tribute to his genius and industry, which leave so little for his followers to glean in the field of applied optics which he has cultivated so well; and it is not the least interesting result of the numerous clinical observations made with the instrument here described, that we can venture to propose to the distinguished author of the "Accommodation and Refraction of the Eye," a fixed quantity for the pupil of his reduced eye, which so well represents the properties of the complicated human organ, but simplifies all its optical problems in so wonderful a manner.

The practical use of the instrument has been recently tested in the examination of a number of deaf-mutes, one needing $+ 3 \frown + 4^{c}$, another $- 4 \frown - 3.5^{c}$ corrected to $\vee \frac{1}{1}$, without the very tedious use of glasses aided by the ophthalmoscope; and in a case of aphakia needing 11 D. corrected in a few minutes, and a high myopia brought to $\vee \frac{20}{xxv}$ by $-$ 15 D. with a very short examination.

AN EXAMINATION, UNDER ATROPINE, OF THE REFRACTIVE STATE OF EYES WITH NORMAL VISION ($\frac{20}{20}$), AND WHICH HAD NEVER BEEN AFFECTED WITH ASTHENOPIA OR INFLAMMATION. By D. B. St. John Roosa, M.D.

It will be at once seen that it is a very difficult thing to procure for examination many eyes that answer to the above-named conditions; and when is added to them another, that is, that the subjects shall be between twenty and forty years of age, the difficulties are not diminished. The importance of such an examination is, however, I think, considerable, for it has been claimed by some that latent hypermetropia and astigmatism are the causes not only of asthenopia, conjunctivitis, blepharitis, etc., but also of chorea and lachrymal disease, while on the other hand, as good an authority as Dr. E. Hansen, of Copenhagen, is very sceptical as to the universal or even general value of the correction of hypermetropia for the relief of asthenopia. In a conversation with Dr. Hansen, last summer, he informed me that he found that glasses in very many instances seemed to utterly fail to afford relief to asthenopia associated with and apparently caused by hypermetropia. Dr. Hansen has peculiar opportunities for observation upon this subject, for he enjoys almost a monopoly in ophthalmic practice in the Danish capital; and patients have not the same liberty that is enjoyed in American, English, or German cities, of roaming about from one oculist to another when their glasses do not suit, or their eyes do not get well. We have had abundant statistics as to the existence of myopia and as to the apparent refraction of unatropinized eyes. I have thought it desirable, however, to learn the refraction of those that have been classified as emmetropic. It is claimed, however, that there is a source of error in drawing conclusions from this kind of an examination. It has been said that we almost invariably flatten the lens in putting an eye under the full influence of atropia. If this be true, we always either diminish myopia under such circumstances, or convert emmetropia into hypermetropia.

My statistics show that there was a certain proportion of cases among those examined that continued to reject even the weakest convex glasses, after atropia had been thoroughly used. Besides, I

think every one of us had seen cases of myopia which were not at all reduced in degree, after the drug had been employed long enough to test the matter. I cannot, in the face of these facts, assent to the view that atropia flattens the lens except in so far as it acts by paralyzing the ciliary muscle, and thus brings out the true length of the eyeball in a state of rest. Apart from this view, however, there is another importance to such an examination as I have made.

It has been generally, if not universally conceded, that, if atropia reveals hypermetropia in cases of inability to use the eyes for continued work, glasses are to be given somewhat in accordance with those taken when the eyes are atropinized. Some authorities even advise full correction. Now, if we find that a large proportion of eyes that have never suffered from asthenopia take convex glasses which were rejected before the mydriatic was used, we may suspect that the mere existence of lessened refraction or latent hypermetropia is no positive proof that asthenopic eyes are to be cured by positive glasses—in other words, that there may be other factors producing the trouble. The amount of latent hypermetropia revealed in these cases thus rigorously selected is in many instances equal to that for which oculists all over the world, ever since the publication of Donders' book, have been prescribing glasses. Indeed, I think it has been pretty generally assumed that the cause for a given case of asthenopia had been found if atropine revealed hypermetropia. In later times it has been claimed that the etiology of headaches, of chorea, of lachrymal disease, has been very largely traced to latent and uncorrected refractive errors. Whatever the subjoined statistics may be worth, they at least show, few as they are, that a decided amount of latent hypermetropia is entirely consistent with uninterrupted and painless use of the eyes. This, however, is a fact that I commented upon some two years since, having deduced it from other grounds, namely, that we were quite often called upon to fit presbyopes who were also hypermetropes, with glasses for the first time when their accommodation began to fail, they never before in all their lives having had any necessity for glasses.

We cannot any longer assume, I think, that latent hypermetropia is necessarily the sole factor in the production of asthenopia, much less of troubles of the head and nervous system. That hypermetropia does often produce many of these things, and that its correction will often relieve them, I am of course very far from denying. But I am unable to say why it does not in all of them, especially when in looking over my statistics I find that, in some of the cases that have

never suffered for an instant from asthenopia, all the conditions for the injurious influences of strain of the accommodation have existed in feeble organizations and weak muscular systems.

Had I not had the facilities afforded by a large class of medical students, who are very ready for physiological experiments, I should never have succeeded in getting the cases that I now present. I must here present my grateful acknowledgments to the members of the Class of 1877–78 in the University of the City of New York, who so kindly submitted to the troublesome tests. It of course goes without saying, that all the cases now about to be quoted conform to the conditions stated in the foregoing, *i. e.*, the patients were not presbyopic : they had also passed the age during which, in the opinion of some authorities, hypermetropia is always found ; they had V. $\frac{2}{2}0$, that sight was blurred by convex glasses of $+ \frac{1}{6}0$, and in some cases of still weaker power, they had never in all their lives suffered from asthenopia or ocular inflammation, and their accommodation was paralyzed by a four-grain solution of sulphate of atropia.

Observation.

I.—Dr. S., æt. 30. V. R. E. $= \frac{2}{1}0$; L. E., $\frac{2}{2}0$. After a four-grain solution of the sulphate of atropia had been used four times in twenty-four hours, the vision of the right eye was reduced to $\frac{2}{5}0$. It became $\frac{2}{1}0$ with $+ \frac{1}{6}0 \supset \frac{1}{6}0^{c}$ 90°. This gentleman used atropia for four days, and had some marked constitutional symptoms. The final examination showed H. $\frac{1}{3}6$ with H. as $+ \frac{1}{6}0$ axis 90°.

II.—J. C. M., æt. 21. Began to go to school at seven, and has used his eyes as a student nearly ever since ; V. $= \frac{2}{1}3 +$. All positive glasses blur. After the use of atropia, gr. four solution, three times in two days, vision with the right eye became $\frac{2}{2}0$ with $+ \frac{1}{4}2$; L.E., $\frac{2}{4}0$ without glasses, and $\frac{2}{2}0$ with $+ \frac{1}{3}6$.

III.—W. H., æt. 34. After atropia four times in twenty-four hours, L.E. having been atropinized, V. $= \frac{2}{2}0 +$ before atropia, $\frac{2}{2}0$ with $+ \frac{1}{6}0$; two days after, $\frac{2}{2}0 -$ with $+ \frac{1}{6}0^{c}$ 90° $\frac{2}{2}0$.

IV.—H. J. H., æt. 29. Has used his eyes as a student and teacher since he was six or seven years old ; is thin and pale, only moderately well developed ; right eye examined after atropia instillation twice a day for two days. Accepts $+ \frac{1}{2}4$ on the second day, the day after $+ \frac{1}{3}0$ with which V. $= \frac{2}{2}0$. Left eye of same patient was tested in the same way a month before ; vision was $\frac{2}{4}0$ under atropia without a glass, and $\frac{2}{2}0$ with $+ \frac{1}{2}4$. The subject is anæmic and thin ; has bronchitis every winter ; one member of family died of phthisis.

V.—W. H., æt. 32. Has not been a very constant student; never the slightest trouble with his eyes, except occasionally after reading very fine print by gaslight for several hours, eyes have felt tired and he has been inclined to rub them; never obliged to stop work on account of his eyes. Is in good health and of robust appearance. After the use of atropia three times a day for three days, V. = $\frac{20}{20}$ and all glasses are rejected.

VI.—W. F. C., æt. 27. School at an early age; has studied medicine for a year. Interval of ten years, when his eyes were used only in ordinary reading. "Fatigue" of eyes after three hours' work. Is robust and in good general health, V. = $\frac{20}{20}$ R.E., accepts + $\frac{1}{12}$, rejects + $\frac{1}{60}$; L.E., $\frac{20}{20}$ + $\frac{1}{12}$, blurs; atropia two days, L.E.V. = $\frac{20}{40}$; with + $\frac{1}{36}$, = $\frac{20}{20}$.

VII.—H. R. D., æt. 21. At school until eighteen; writing for a year after; has studied medicine since. V. = $\frac{20}{20}$ + $\frac{1}{12}$, blurs; after one use of atropia, V. was not $\frac{20}{20}$ unless with + $\frac{1}{36}$.

VIII.—R. D. B., æt. 22. Has always been a student; = $\frac{20}{20}$, rejects + $\frac{1}{60}$. Atropia for three days, V. = $\frac{20}{20}$, declines + $\frac{1}{60}$.

IX.—C. A. V. R., æt. 22. At school regularly in Germany from sixth to seventeenth year: studied medicine three years; never the slightest asthenopia. L.E., V. = $\frac{20}{20}$, all convex glasses blur.

Four-grain solution atropia four times in eighteen hours. V. = $\frac{20}{40}$, with + $\frac{1}{30}$, = $\frac{20}{20}$.

X.—D. M., æt. 26. Has been a student since five years of age. V. $\frac{20}{20}$; atropia in left eye for two days. V. = $\frac{20}{40}$, with + $\frac{1}{12}$, = $\frac{20}{20}$; third day $\frac{20}{50}$; with + $\frac{1}{30}$, $\frac{20}{20}$.

XI.—W. A. W., æt. 24. Always a student. V. = $\frac{20}{20}$; + $\frac{1}{80}$ blurs. Atropia in left eye for two days. V. = $\frac{20}{1000}$; with + $\frac{1}{24}$, $\frac{20}{20}$ — (it is a dark day), and the observer's vision is also $\frac{20}{20}$ —.

XII.—G. M. B., æt. 23. Went to school from five till eleven; then salesman and bookeeper; has studied medicine two and a half years. R.E., V. = $\frac{20}{25}$; L.E., $\frac{20}{20}$; all convex glasses blur; atropia one day. R.E., V. = $\frac{20}{50}$; with + $\frac{1}{30}$, = $\frac{20}{20}$.

XIII.—B. W., æt. 27. Went to school four months a year until fifteen; then to an academy two years for eight months in a year; taught school for four years; has been studying medicine for three years. V. = $\frac{20}{20}$, + $\frac{1}{12}$, blurs; atropia one day in each eye. V. = $\frac{20}{30}$, each eye, with + $\frac{1}{24}$, $\frac{20}{20}$.

XIV.—Dr. S., æt. 22. V. = $\frac{30}{20}$, each eye. Was for two weeks under the influence of a four-grain solution of sulphate of atropia;

suffered from great dryness of the throat; atropia did not alter vision, and + $\frac{1}{80}$ blurred before and after its use.

To these fourteen cases I will add one of a lady thirty-two years of age, who consulted me on account of neuralgic pains about the eyeball and orbits. There was also asthenopia, and she complained of muscæ. She had been unable to do fine work for the past two months. The patient is a nervous lady who is somewhat overworked with household cares. The refraction seemed to be H. by the ophthalmoscope. V. = $\frac{20}{30}$, and all glasses blur; after atropia was used for six days the vision was $\frac{20}{20}$, and the patient still rejected all glasses.

Summary.—Total number, 14.

Emmetropia, 3.

Hypermetropia, 11.

Degrees of H.:

$\frac{1}{36}$ ⌒ $\frac{1}{60}$ c a 90°.

$\frac{1}{42}$, L.E., $\frac{1}{30}$.

$\frac{1}{60}$ c, 90°.

R.E., $\frac{1}{30}$, and L.E., $\frac{1}{24}$.

$\frac{1}{36}$.

$\frac{1}{36}$.

$\frac{1}{30}$.

$\frac{1}{30}$.

$\frac{1}{24}$.

$\frac{1}{30}$.

$\frac{1}{24}$.

ON SOME IMPROVEMENTS IN INSTRUMENTS AND APPLIANCES FOR DIAGNOSIS.

By John Green, M.D., of St. Louis, Missouri.

I. TEST-DIAGRAMS FOR THE DETECTION AND MEASUREMENT OF ASTIGMATISM.

The diagram shown, of one-fifth its actual size, in Fig. A was designed and drawn by the writer, while spending a few weeks in attendance upon the clinique of Professor Donders, in the spring of 1866. The purpose was to construct a system of practical tests for astigmatism, to be used like the test-types of Snellen, at a distance of twenty Paris feet. A figure—Fig. 1—made up of three parallel lines with interspaces of the same width, which had been given by

Fig. 1.

Snellen in the first edition of his *Test-Types*, but which had been omitted from the second edition, was taken as the basis of the diagram. Twelve such sets of lines, arranged as radii of a circle, were printed in the centre of a clock-dial as being the only graduation of the circle familiar to all persons. Two other diagrams, Figs. B and C, were added, the one to indicate with more precision the direction of the principal meridians, the other to facilitate the measurement of the refraction in one or the other of these meridians when found. The triple radii of Fig. A were also engraved to show as white lines upon a dark ground.

The dial-card, mounted upon thick paste-board, was fitted with a central pivot for holding any one of the circular disks and permitting it to be turned into any desired position.

These test-diagrams were published, together with a brief description, in the Report of the Netherlands Ophthalmic Hospital for 1866, and also in the Netherlands Archives for the same year.[1]

A few months later, in a paper published in the *American Journal*

[1] Verslag Ned. Gasth. v. Oogl., VII., 1866. Ned. Arch. v. Gen. en Natuurk., II., 1866.

of the Medical Sciences,[2] the writer described an additional disk, Fig. F, and the two arrangements of short single lines or sets of parallel lines in linear series, Figs. D and E. The disk, Fig. F, was made by punching rows of circular holes, of about six millimetres in diameter, in black card-board, and covering the holes with thin tissue paper so as to adapt it for use as a transparent object to be hung in a window and viewed by transmitted light.

At the meeting of the American Ophthalmological Society, June, 1867, several additional diagrams and perforated disks, Figs. G to O, were presented, and at the meeting of 1868 a transparent test-object was shown, in form like Fig. O, but with the light radii in carmine red and the intervening sectors in ultramarine blue; in this last arrangement the presence of astigmatism is revealed by a conspicuous difference in the apparent color of the radii corresponding to the several ocular meridians.

The original impression of these diagrams having been for several years exhausted and the plates destroyed, new plates have been lately prepared, introducing several changes and additions which have been thought to be of practical utility.

In the plates first engraved the thickness of the lines was made to conform to that adopted in No. XX. of Snellen's test-types, with the design of making the recognition of the lines in any one meridian the standard of perfect vision in that meridian. It soon appeared, however, that such a standard was inapplicable in practice, and that the diagrams drawn upon this scale were more useful when placed at a distance not exceeding ten or fifteen feet from the eye. Lines much broader than those first adopted were also found to be more useful in many cases, and were therefore introduced in several of the diagrams of 1867. In the present edition the lines are drawn of three different widths, corresponding to a visual angle of one minute at distances of eight, sixteen, and thirty-two metres, and the tests are intended to be used at any convenient distance within the limits of an ordinary room.

Of the original diagrams, those shown in Figs. A, B, and K, are now reproduced upon a somewhat enlarged scale, so that the thickness of each line subtends an angle of one minute at a distance of eight metres. Fig. C is replaced by a similar figure, Fig. Q, drawn to the scale of two minutes at eight metres, and Fig. P, a similarly enlarged reproduction of Fig. A, is added. Figs. F, J, and O, are reproduced

[2] Am. Jour. Med. Sciences, N. S., LIII., Jan'y, 1867.

unchanged, the lines in Fig. O being drawn to subtend an angle of four minutes at eight metres, and the narrow sectors in Fig. J to subtend an angle decreasing from about five minutes at eight metres near the periphery of the disk, to about one minute at one metre near the centre.

The diagrams shown in Figs. R to Z are now given for the first time. Fig. R, suggested by a figure from Donders[3], is made up of black radii, about a centimetre in width, crossed by white lines half a centimetre apart and about a millimetre in thickness. Figs. S and T consist each of a triple ring, each single ring subtending an angle of one minute or of two minutes at eight metres. Figs. U and V show four and eight sectors respectively from Fig. J, and bear to the original diagram the same relation that Figs. C and K bear to Fig. A. The arrangement shown in Fig. U was suggested to the writer by Dr. H. D. Noyes, of New York, who has also publicly referred to it.[4]

The other new diagrams, Figs. W, X, Y, and Z, are combination figures of circles, as shown in Figs. T and S, intersected by radii as shown in Figs. A, P, B, and J. In these diagrams the contrast between the two sets of lines at the place of intersection is the strongest possible, and the difference is, therefore, more easily appreciated than in the case of diagrams made up of circles or radii alone. But in addition to the greater strength of contrast, a new appearance is produced, which is at once striking and easily described, viz., a broken or jagged aspect of the lines upon either side and in the neighborhood of the line or set of lines which is seen most distinctly and sharply defined. (See Figs. XX and YY, which are heliographs of Figs. X and Y, taken with a camera rendered astigmatic by the addition of a weak cylindrical lens.) In using these combination diagrams the attention of the patient is directed successively to the meridians of the greatest distinctness of the radii and of the circles, and lastly, for the purpose of accurately determining the direction of these meridians, to the exact positions in which the lines appear both sharply defined and unbroken.

Several of these tests may be readily used as transparent objects by punching out the light parts from disks of metal or card-board and pasting thin paper, which may be either white or colored yellow or red, over the openings. Figs. F, G, H, I, N, and O, are especially adapted to this treatment. By the process of printing in black

[3] Anomalies of Accommodation and Refraction. Syd. Ed., p. 471, Fig. 158.

[4] Rep. Fifth International Ophthalmological Congress, N. Y., 1877, p. 173.

woollen "flock" on translucent paper, or varnished silk, or linen, it is possible to produce transparent tests in almost any desired form.

In the notation which has from the beginning commended itself to the writer,[5] and which has since been adopted by Snellen,[6] the upper end of the vertical meridian, or XII of the clock dial, is taken as zero, and the inclination of the meridian of greatest refraction is read off to the right of XII up to 90° with the *plus* (+) sign, and similarly to the left of XII with the *minus* (−) sign. This notation is based upon the anatomical law of bilateral symmetry, and brings out prominently the important relation of symmetry or asymmetry in the direction of the principal meridians in the two eyes.

Small figures made up of numerous very fine radiating lines were very early used to illustrate the general phenomena of astigmatic vision,[7] and Donders, in 1860 or earlier, used in an optometer a star shaped figure made up of fine radiating lines, as a practical test for astigmatism.[8] Burow, in 1863, suggested a similar or perhaps identical arrangement,[9] and two years later Javal, with the co-operation of Nachet, produced an elaborate binocular optometer in which substantially the same test-object was employed.[10]

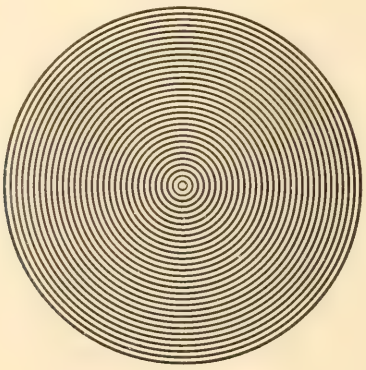


Fig. 2.

A disk covered with fine concentric circles, like Fig. 2, was long ago

[5] Trans. Am. Ophth. Soc., 1867–8, p. 134.
[6] Archiv für Ophthalmologie, XV., II., Tafel VIII.
[7] Helmholtz. Physiolog. Optik, Pl. II., Fig. 5.
[8] Archiv für Ophthalmologie, VII., I., p. 179.
[9] Ibid., IX., II., p. 230.
[10] Annales d'Oculistique, LIII., 1865.

used by Helmholtz[11] to illustrate and analyze that form of irregular astigmatism which depends upon refractive differences in the different sectors of the crystalline lens, and a coarsely executed lithographed card, containing a small disk of such construction, and also a small star-shaped figure made up of radiating lines, as in Fig. B, was many years ago sold in Berlin as a test for astigmatism.

Large test-objects, such as were first described and put in use by the writer, in which the scale admits of their being viewed from a distance at which the visual axes are sensibly parallel and the accommodation is ordinarily relaxed, are now perhaps generally admitted to offer positive advantages, in most cases, over small objects which must necessarily be held near the eye. In the selection of such test-objects from the great number of possible variations and combinations of the elementary forms, it has been found advantageous to include those of somewhat diverse appearance and drawn to several different scales. The coarser diagrams are especially useful in investigating the higher grades of astigmatism, and it is always desirable to have a number of fresh tests in reserve, in dealing with dull or careless patients. A further reason for varying the diagrams as much as possible is founded on the fact that many persons suffering from astigmatism find it very difficult to analyze and define visual perceptions which they know from life-long experience to be more or less inaccurate.

Fig. 3.

Diagrams presenting large surfaces covered with parallel lines, as in Figs. L and M, and in Fig. 3, or with concentric circles, as in Fig. 2, have been rejected, as, on the whole, not well suited to the investigation of astigmatism. They all have the great disadvantage of dazzling the retina of even the healthy emmetropic eye, and in astigmatism they often prove in a high degree distracting to the patient and annoying to the examiner. The reason of this is apparent when we remember that figures with numerous parallel straight lines are among the best tests known for illustrating the phenomenon of the limitation of visual acuteness dependent on the size of the ultimate percipient elements of the retina, and that, similarly, the

[11] Helmholtz. Physiolog. Optik, Pl. II., Fig. 4.

disk of fine concentric circles is peculiarly the test for irregular refraction, having its seat in the crystalline lens. Used at comparatively short distances from the eye, such diagrams serve perfectly to demonstrate the general phenomena of astigmatism, but they are by far inferior to simpler figures for analyzing and measuring it in practice. Even the triple rings in Figs. S and T have been proved to be much less useful in practice than the diagrams made up of radii.

Since the first publication of these test-diagrams numerous imitations and reproductions of them, more or less varied, have appeared. Diagrams substantially identical with Figs. A and E, but considerably amplified, and drawn upon several different scales, were published in 1868, in Vienna, in the name of Dr. O. Becker,[12] and quite recently Mr. Carter,[13] of London, has described and figured, as original, an arrangement substantially the same as Fig. C, and like it, made to turn upon a dial card. Snellen, from whose first edition of test-types the triple line, Fig. 1, was borrowed, has restored this figure in his third and later editions, and has also substantially adopted the diagram, Fig. B, but he has drawn it with thirty-six radii instead of sixty, and has cut off the lower half of the circle, so as to give a figure like Fig. 4, which has the single advantage of falling within the limits of

Fig. 4.

the octavo page of his *Test-types*.[14] Other reproductions have appeared, generally without acknowledgment of their origin and for the most part with unimportant changes of scale or arrangement, but none of them present any peculiarity deserving of notice. One test, however, of those which have appeared since the writer's earlier publications, and which have come to his knowledge, is both ingenious and useful, viz., the *Test-types for astigmatism* of the late Dr. O. F. Pray.[15] By the happy device of cutting out portions of the striped sectors

[12] Vier Tafeln zur Bestimmung des Astigmatismus. Wien, 1868.

[13] Practical Treatise on Diseases of the Eye. London, 1875. Fig. 91, p. 575.

[14] Optotypi ad visum determinandum, confecit Herman Snellen, MDCCCLXXV.

[15] Archives for Ophthalmology and Otology, I., I.

from the diagram shown in Fig. L, in the form of letters, Dr. Pray succeeded very perfectly in overcoming the dazzling and confusion which are generally experienced in looking at large surfaces covered with fine parallel lines. By increasing the number of letters constructed in this manner, and drawing them upon an enlarged scale, he produced the well-known and generally approved sheet of letters which bears his name.[16]

[Figs. A, B, and C, illustrating this communication, were originally published of full size (about ten inches in diameter), at Utrecht in 1866 (*Ned. Arch. v. Gen. en Natuurk.*, II., *Verslag Ned. Gasth. v. Oogl.* No. VII.), and thus attained quite a wide circulation. Figs. D and F are reproduced from a paper by the writer in the *American Journal of the Medical Sciences* for January, 1867, in which paper the arrangement shown in Fig. E is also described. Figs. G to O represent test-objects exhibited at the meeting of the *American Ophthalmological Society*, in June, 1867, and appeared in the Transactions of the Society together with Figs. A, B, E, and F. Figs. P to Z, which appear now for the first time, are reduced copies of diagrams engraved about two years ago and exhibited at the present meeting. These reduced diagrams are useful in testing myopes for astigmatism, and may also be used in a lenticular optometer.]

[16] Dr. Pray's Test-types for Astigmatism were first published several months after his death, which occurred in 1869. The sheet of types published by Wm. Wood & Co., of New York, was exhibited at the meeting of the American Ophthalmological Society, in July, 1869, by Dr. H. D. Noyes, of New York, together with the original drawing, a copy of Fig. L, in which a letter was cut from each of the twelve sectors.

II. STEREOSCOPIC DIAGRAMS FOR TESTING BINOCULAR VISION.

The ordinary stereoscopic slides, with photographic pictures, are not well adapted for use as tests of binocular vision and of the binocular perception of solid forms. The relaxation of the accommodation and convergence in using the lenticular stereoscope, and the accurate perspective and perfect reproduction of atmospheric effects and of lights and shadows in the photographic pictures, suffice generally to give the impression of distance and solidity even when identical pictures are placed before the two eyes, and in many cases also when the right and left hand pictures are interchanged. Engraved geometrical figures, such as were furnished with the earlier stereoscopes, are very striking objects to persons who enjoy perfect binocular vision, but the drawing is often so suggestive of the solid form as to make it difficult to decide whether the true stereoscopic effect is perceived by a person whose power of binocular vision is the subject of investigation. The writer has, from time to time during the past ten years, constructed diagrams especially for use as tests of binocular vision; a few of these are now presented as examples of such forms as have been found useful in practice.

(1.) *Diagrams made up of two wholly dissimilar pictures.*

Figures 1 and 2, to a person with fair binocular vision, show the two figures facing each other and in the act of boxing. Owing, however, to the absence of corresponding points in the two pictures, upon which the two eyes may rest, the figures appear unsteady, and move towards and away from each other in a somewhat capricious manner. If but one figure is seen, it is easy to identify it by its attitude and by the way it faces. In Fig. 1 the two figures appear much nearer to each other than upon the card. In Fig. 2 they appear to be transposed.

(2.) *Diagrams made up of figures in part identical, but which by superposition in the stereoscope produce a third figure different from either.*

Fig. 3, as seen by the right eye, shows the letter L, by the left eye the letter F, by both eyes together the letter E.

Figure 4 is the same as Figure 3, but with the letters transposed.

(3.) *Mirror effect produced by combining a white with a black surface.*

In Fig. 5 each ring fuses with the peripheral portion of the corresponding black disk, giving rise to the illusion of a mirror set in a black ring. The pictures, as seen by the right and left eye respectively, are identified by the relative position of the ring and disk.

Figure 6 is the same as Figure 5, but with the cuts transposed.

(4). *Diagrams illustrating the stereoscopic effects of difference in distance, obliquity of position, and difference in size and form.*

In Figure 7 the two pairs of disks are fused in the stereoscope into two disks, one above the other. The disk which corresponds to the more widely separated pair appears to be farther distant than the other from the observer; it also appears conspicuously *larger*, a necessary consequence of the illusion of greater distance when unaccompanied by any corresponding diminution in the size of the retinal image. This illusion of difference in size is very striking, and is often seized by the patient when the difference in distance is imperfectly or more tardily recognized.

Figure 8 is the same in principle as Figure 7, but differs from it in the arrangement of the rings.

Figure 9, showing three rings, and Figure 10, in which the drawing suggests something of the solid form, sometimes give positive results when the other tests have proved indecisive.

Figure 11 shows one arrow pointing forward, the other backward.

In Figure 12, representing two possible aspects of a quadrilateral as seen by the two eyes, one of the figures is a square and the other a rectangle of the same height, but of less horizontal measurement. On fusing the two figures in the stereoscope, the resultant figure assumes an oblique position as if turned upon a vertical axis. Although both of the component figures are rectangular, the combination figure is not a rectangle, but has its nearer side conspicuously shorter than its farther side.

Figures 13 and 14 represent similarly two possible aspects of an ellipse, one of these aspects being in each case a circle.

Figures 15 and 16, ellipses symmetrically arranged in pairs, show a rotation of the resultant figure upon a horizontal axis, and also a change in its apparent shape, which in Figure 15 is that of a long ellipse, and in Figure 16 approximates a circle. These effects may be infinitely and strikingly varied by arranging the two figures to turn symmetrically, each upon a central pivot.

[The cuts, Figs. 1 to 16, illustrating this section, are printed upon separate cards for use in the stereoscope, and accompany this number of the *Transactions*.]

III. A NEW MODIFICATION OF LORING'S OPHTHALMOSCOPE.

Ophthalmoscopes fitted with a single or double disk, containing a number of lenses designed to facilitate the inspection of the fundus in the erect image, are among the earlier forms of the instrument.[1] Equally old is the idea of using the ophthalmoscope for measuring the refraction,[2] and the series of correcting glasses furnished with some of the older instruments was quite sufficient for such rough determinations as were considered practicable.[3] The double-disk attachment of Rekoss to the original Helmholtz ophthalmoscope, and the pocket ophthalmoscope of Stellwag with its single disk of eight openings,[4] exhausted most of the possibilities in the way of mechanical adjustments, but neither of these devices was intended or sufficed for accurate measurements of refraction.

The first practical ophthalmoscope designed for the measurement

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[1] Helmholtz's Ophthalmoscope with Rekoss' double disk, each disk with five openings and four concave lenses, giving a possible range of combinations between $-\frac{1}{14}$ and $-\frac{1}{3}$.

Donders' modification of Epkens' ophthalmoscope, with a single disk of seven openings containing the series + 25, + 12.5, + 5, − 6.25, − 10, and − 16.6 *metric units.*

[2] Der Augenspiegel als Optometer, von Prof. Jaeger, Jr. (Oesterr. Zeitschr. für pract. Heilkunde, 1856).

[3] Jaeger's larger ophthalmoscope was furnished with the series $-\frac{1}{2}$, $-\frac{1}{3}$, $-\frac{1}{4}$, $-\frac{1}{5}$, $-\frac{1}{6}$, $-\frac{1}{8}$, $-\frac{1}{10}$, $-\frac{1}{12}$, $+\frac{1}{12}$, $+\frac{1}{8}$, $+\frac{1}{6}$, $+\frac{1}{2}$.

Early in 1866 the writer had made, by Nachet of Paris, a set of ophthalmoscope mirrors with clips admitting of the employment of the entire series of test-glasses in the trial case, both spherical and cylindrical.

A device similar to the last, but in an improved form, was exhibited by Dr. H. D. Noyes, at the meeting of the American Ophthalmological Society for 1869, and is figured in the Transactions of that year (p. 59). It is the best instrument known to the writer for obtaining a perfect view of the fundus of an astigmatic eye in the erect image.

At the meeting of the American Ophthalmological Society for 1873 (Trans. 1873), Dr. Knapp stated that, "some years before Dr. Loring constructed his instrument, he [Knapp] had a complete collection of small trial-glasses made, which he could insert into an ordinary small (Liebreich) ophthalmoscope.

[4] Containing the series $+\frac{1}{2}$, $+\frac{1}{6}$, $+\frac{1}{12}$, $-\frac{1}{12}$, $-\frac{1}{10}$, $-\frac{1}{8}$, $-\frac{1}{4}$, $-\frac{1}{2}$. For a description and figure of this ophthalmoscope, see Pilz, Lehrb. der Augenheilk., S. 146.

of the refraction is, unquestionably, that of Loring,[5] which was first made with three interchangeable disks, and the introduction of this instrument marks also the beginning of the general employment of the objective method in the quantitative diagnosis of ametropia. Loring's first ophthalmoscope, though quite sufficient for the practical requirements of the ophthalmoscopist, has been considerably modified in form by its inventor and others,[6] and, as now constructed, is a much more elegant and more convenient instrument than it was in the beginning.

The ophthalmoscope now shown is based upon one of the earlier forms of Loring's instrument,[7] and was made for the writer, in the summer of 1876, by Hunter of New York. The hinged mirror is taken from a later ophthalmoscope also by Loring, and made by Hunter.[8] The especial feature in the instrument taken as a model

[5] Trans. Am. Ophth. Soc., 1869; Am. Jour. Med. Sciences, Jan., 1874; Trans. Am. Ophth. Soc., 1874; Determination of the Refraction of the Eye by Means of the Ophthalmoscope, by E. G. Loring, M.D., N. Y., 1876; Rep. Fifth Internat. Ophth. Congress, 1876.

[6] These changes have consisted chiefly in collecting the glasses from Loring's original three disks into a single disk or two disks. Thus, Cohn (Klinische Monatsblätter, Oct., 1872) placed Loring's whole series of glasses in a single disk of inconveniently large size; de Wecker (Ibid., Aug., 1873) placed the same series in a single small disk, but by so doing made the glasses inconveniently small; and Loring (Am. Jour. Med. Sciences, Jan., 1874), by an ingenious and novel arrangement, mounted the twenty-three glasses in one disk, but in two concentric circles, thus solving the problem of mounting a large series of conveniently large glasses in a conveniently small disk. Knapp also having had one of Loring's instruments with the three disks in daily use during about four years, produced a modification of it in which nearly the same series of lenses was mounted in two disks instead of three (Trans. Am. Ophth. Soc., 1873; Archiv. for Ophthalmol. and Otol., III., II., p. 2). As an incident to this construction with two disks it was possible to use some of the weaker glasses of each disk to fill the large gaps between the higher numbers of the other, but the instrument did not realize the possibilities of a combination ophthalmoscope, either in economy of lenses or regularity of intervals.

[7] Loring, Determination of the Refraction of the Eye by Means of the Ophthalmoscope, p. 10, Fig. 6. Also Rep. Fifth Internat. Ophth. Congress, p. 83, Fig. 4. This arrangement of twelve selected glasses in a single disk of thirteen openings, was made by Loring as a cheap and simple ophthalmoscope for students, and the instrument has been made and kept on sale by Hunter since 1871.

[8] Rep. Fifth Internat. Ophth. Congress, p. 85, Fig. 6. This mirror, mounted in a cell which is arranged to rotate in its own plane, appears to the writer to be on the whole preferable to the tilting mirror which is furnished with Loring's later instruments.

is the rotating disk of thirteen openings, in which are mounted twelve correcting glasses, six of which are convex and six concave. The writer has placed in this disk a series of lenses in regular progression, and has added a second disk, of five somewhat larger openings, in which four additional glasses are mounted. The construction of the instrument, as thus modified, is shown in Fig. 1, with a series of lenses based upon the unit lens of twenty-four inches (English) focus.[9]

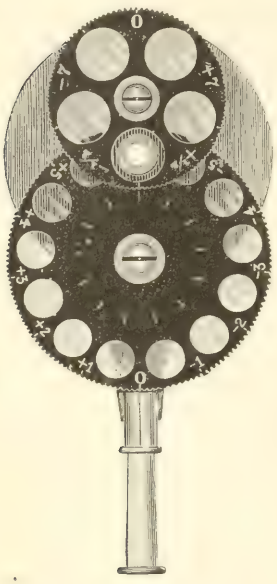

FIG. 1.

In the principal disk of thirteen openings, each five millimetres in diameter, are set twelve glasses giving the series,

$$\text{O},\ \begin{matrix} + \\ - \end{matrix}\ 1,\ 2,\ 3,\ 4,\ 5,\ 6,$$

the second disk, of five openings, each six and a half millimetres in diameter, contains the additional numbers,[10]

$$\text{O},\ \begin{matrix} + \\ - \end{matrix}\ \tfrac{1}{2},\ 7,$$

either of which may be superimposed at will upon any one of the lenses or upon the vacant opening in the principal disk. Thus, by adding + 7 or — 7, the series is extended on the one hand

[9] This is the unit-measure long ago proposed by Donders for indicating the range of accommodation; it is the No. 24 of the French scale, with radii of curvature equal to twenty-four Paris inches, and a focal length of almost exactly twenty-four English inches; it may, therefore, be most properly designated as $\frac{1}{24}$ *Eng.* The series of lenses is thus made up from numbers of the French scale, as follows:

$$\text{O},\ \begin{matrix} + \\ - \end{matrix}\ \tfrac{1}{24},\ \tfrac{1}{12},\ \tfrac{1}{8},\ \tfrac{1}{6},\ \tfrac{1}{4.8},\ \tfrac{1}{4},$$
$$\text{O},\ \begin{matrix} + \\ - \end{matrix}\ \tfrac{1}{24},\ \tfrac{1}{12},\ \tfrac{1}{8},\ \tfrac{1}{6},\ \tfrac{1}{4.8},\ \tfrac{1}{4}.$$

[10] Actually,

$$\text{O},\ \begin{matrix} + \\ - \end{matrix}\ \tfrac{1}{48},\ \tfrac{1}{48},$$

of numbers from the French scale.

This series of glasses may be slightly changed, in the interest of the instrument maker, by substituting + 6 and — 6 for + 7 and — 7; the second disk will then contain

$$\text{O},\ \begin{matrix} + \\ - \end{matrix}\ \tfrac{1}{48},\ \tfrac{1}{4},$$

and the range of this instrument will be from + 12 (= + $\frac{1}{2}$) to — 12 (= — $\frac{1}{2}$).

to + 13, and on the other to — 13 : and similarly, by using the numbers + ½ and — ½, we halve the common interval of unity between the limits + 7 and — 7.[11]

A second arrangement of lenses, based upon the *metre-lens* as the unit, is shown in Fig. 2. The numbering of the glasses in the principal disk is the same as in the former arrangement, but with changed values based upon the change in the unit.[12] The second disk contains the numbers,

$$0,\ \begin{matrix} +\ 7,\ 14. \\ -\ 7,\ 14, \end{matrix}$$

which, combined with the numbers in the principal disk, give a complete series of forty-one whole numbers, ranging from + 20 to — 20.

Both of these arrangements give series of glasses more extensive than the ordinary range of ametropia, and with gradations minute enough, it is believed, to satisfy the actual needs of practical ophthalmoscopists. The unit $\frac{1}{24}$,

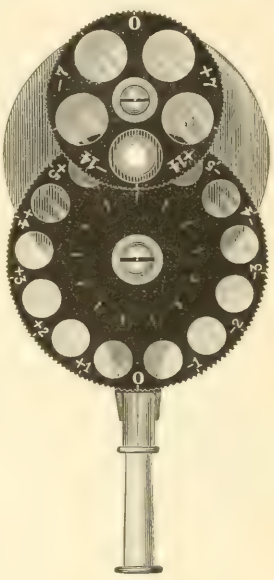

Fig. 2.

with half-unit intervals between + 6½ (= $\frac{1}{3\,1\,3}$) and — 6½ (= — $\frac{1}{3\,1\,3}$). All but one of the numbers (No. 5 = $\frac{1}{4\,1\,5}$) will then correspond exactly with numbers belonging to the French scale as found in commerce.

If a smaller interval than $\frac{1}{48}$ is demanded to meet the requirements of an especially acute observer, the two interpolating lenses may be taken of such values as to divide the common interval $\frac{1}{24}$ into three equal parts. These lenses will then be either + $\frac{1}{72}$ and — $\frac{1}{72}$, + $\frac{1}{72}$ and — $\frac{1}{80}$, or — $\frac{1}{72}$ and — $\frac{1}{80}$, as may be preferred.

[11] The unit $\frac{1}{48}$ may be taken also as the basis of the system and so be used as the common interval throughout the scale. In this case we increase slightly the size of the principal disk, which will then contain seventeen openings instead of thirteen, and mount on it the numbers,

$$0,\ \begin{matrix} +\ 1,\ 2,\ 3,\ 4,\ 5,\ 6,\ 7,\ 8, \\ -\ 1,\ 2,\ 3,\ 4,\ 5,\ 6,\ 7,\ 8; \end{matrix}$$

the second disk will then contain the numbers,

$$0,\ \begin{matrix} +\ 8,\ 16. \\ -\ 8,\ 16, \end{matrix} \qquad \text{or else,} \quad 0,\ \begin{matrix} +\ 9,\ 17. \\ -\ 9,\ 17, \end{matrix}$$

as may be preferred, or as may be more easily executed.

[12] The No. 40 ($\frac{1}{40}$) of the French scale, which, with radii of curvature of forty Paris inches, is a very close approximation to a lens of one metre focus, may conveniently, and with insignificant error, be taken as the *metre-lens*. The series, as

with the half-unit introduced by interpolation between the limits + 7 and — 7, has proved convenient in the writer's practice, but opinions may legitimately be divided as regards the convenience of this arrangement as compared with one based upon the unit $\frac{1}{48}$.[13] Either of these units appears to the writer to be a more convenient measure than the *metre-lens*, although the preponderance of opinion in Europe appears now to be in favor of the latter. If the *metre-lens* is taken as the unit, the use of the half-unit interval will probably be found inconvenient by the larger number of observers, and it will be of scarcely more than occasional utility to the more expert. In the metric arrangement, therefore, the half-unit interval may be most conveniently introduced by interpolation, and it will be needed only in that part of the scale which lies between the limits + 7. and — 7.

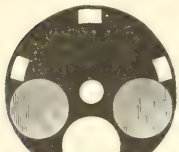

FIG. 3.

Astigmatism, in the eye of the observer, is so serious a hinderance to rapid and accurate ophthalmoscopic investigations[14] as to call for some arrangement by which the glass or glasses needed for its correction, in any particular case, may be made a part of the instrument. Probably the most convenient mounting for these glasses is in a plate (Fig. 3) covering the second disk, and turning independently upon its

given in the text, will then be represented by numbers from the French scale, as follows: in the principal disk,

$$O, \begin{matrix} +\frac{1}{40}, \frac{1}{20}, \frac{1}{13.3}, \frac{1}{10}, \frac{1}{8}, \frac{1}{6.6}, \\ -\frac{1}{40}, \frac{1}{20}, \frac{1}{13.3}, \frac{1}{10}, \frac{1}{8}, \frac{1}{6.6}, \end{matrix}$$

and in the second disk,

$$O, \begin{matrix} +\frac{1}{5\frac{5}{7}}, \frac{1}{2\frac{6}{7}}, \\ -\frac{1}{5\frac{5}{7}}, \frac{1}{2\frac{6}{7}}. \end{matrix}$$

The intervals of this series, as in that based upon the unit $\frac{1}{24}$, may be halved between the limits + 7. and — 7. by the addition of interpolating lenses + .5 and — .5 to the second disk, which will then have seven openings instead of five. These lenses may also be taken of values to subdivide the common interval by three, should any one desire to test such refinements.

[13] See note 11.

[14] The correction of astigmatism is of importance to all observers with optical instruments, as low a degree as $\frac{1}{60}$ materially detracting from the sharpness and quickness of preception, and so confining an otherwise excellent observer to an inferior rank. This is especially true in the case of astronomical observers, who must combine accuracy with quickness of perception in the highest degree. The correcting-glass, which in most cases may be a simple cylindrical lens, either convex or concave, may be set in a cap or short tube, and placed over the eye-piece at the pleasure of the observer.

pivot. It is well to make these glasses a little larger than those of the disk upon which they are superimposed, and they are shown in the figure of a diameter of eight millimetres, the lenses of the second disk, those of the principal disk, and the opening in the mirror measuring six and a half, five, and three and a half millimetres respectively. A fixed covering plate (Fig. 4) may be used in the place of the revolving plate whenever the correcting glasses for astigmatism are not required. The principal disk hardly needs to be covered, as the glasses are perfectly accessible, and can be easily wiped if they become soiled.

A ratchet mechanism for accurately centering the lenses, as in the original Rekoss disks and in most of the recent disk-opthalmoscopes, is often very convenient, by enabling the observer to change the glasses without removing the instrument from his eye.[15]

Figs. 5 and 6 show the ophthalmoscope, fitted with a fixed covering plate, and with the revolving cover, in which two correcting glasses are set. Its weight, exclusive of the long handle, is exactly twenty-eight grammes.

[This ophthalmoscope, substantially as described in this communication, was made in the summer of 1876, and was shown to many members of the International Opthalmological Congress in attendance at the meeting of that body in New York. In consequence, however, of the absence of the writer from the final session of the Congress, it was not publicly shown, and was not noticed in the Transactions. This explanation is called forth by the fact that the writer has but lately (July, 1878) become acquainted with a new and as yet undescribed combination ophthalmoscope by Dr. Loring, which, had it existed earlier, would have rendered this one superfluous. The two instruments, as might be expected in the case of independent productions, differ in form and in some matters of detail—differences which are perhaps sufficient to excuse this somewhat tardy publication.]

[15] A rather long handle, as shown in Fig. 6, is much more convenient than a shorter one. The disk is, however, not easily reached by the finger of the hand holding the instrument. This inconvenience has been quite ingeniously overcome by Loring, in an instrument of which no account has yet appeared in print, by cutting teeth in the circumference of the disk, and thus making it articulate with a second toothed wheel of the same or lesser size placed below it upon the handle.

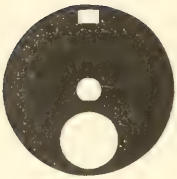

FIG. 4.

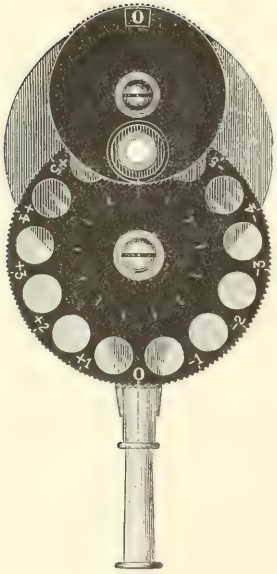

FIG. 5.

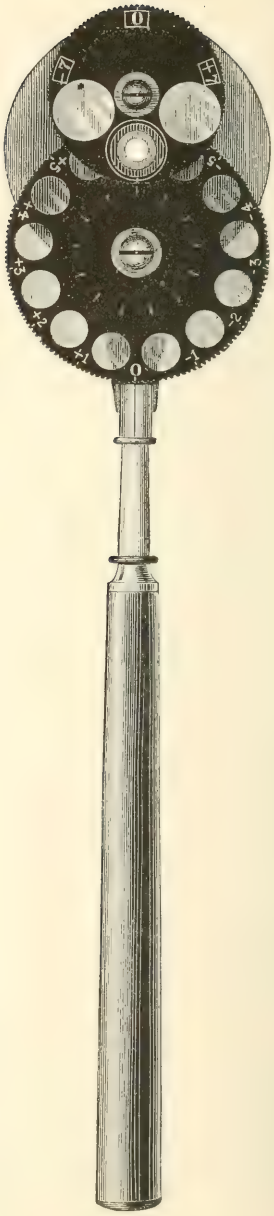

FIG. 6.

4. IMPROVED SERIES AND ARRANGEMENTS OF THE GLASSES OF THE TRIAL CASE FOR MEASURING REFRACTION.

The older trial cases are mere collections, often very incomplete, of the glasses ordinarily kept on sale. The most complete of these, that of Nachet, of Paris, is based on the unit glass of one inch,[1] and contains thirty-two numbers, ranging from $\frac{1}{72}$ to $\frac{1}{2}$, with irregular intervals varying in value from $\frac{1}{360}$ $(= \frac{1}{60} - \frac{1}{72})$ to $\frac{1}{18}$ $(= \frac{1}{2} - \frac{1}{2\frac{1}{4}})$.

The inconvenience of a series thus casually brought together was early recognized, and, in 1864, Zehender[2] proposed for adoption the unit $\frac{1}{48}$, and suggested that by making glasses of the plano-convex and plano-concave form they may be used in combination, and thus the whole series, from $\frac{1}{48}$ to $\frac{1}{2}$, may be made up from ten pairs of convex and ten of concave glasses. For more accurate measurements he suggested the use of a glass of ninety-six inches focus, as a half-unit to be used in connection with the other combinations.

In 1866, Burow, Senior,[3] proposed the untit $\frac{1}{60}$, and suggested that a regular series, based upon this unit, could be selected, with comparatively unimportant error, from the glasses found in the trial cases as made up by Nachet and others. Burow also reconstructed the *règle à calcul* of Javal to correspond with the new unit.

At the meeting of the International Ophthalmological Congress of 1867, Javal advocated the adoption of $\frac{1}{48}$ as the unit, and called attention to the fact that this glass, which is ground with radii of curvature of 48 Paris inches, has a focal length of almost exactly 120 cm.[4] The advantages claimed for the unit $\frac{1}{48}$ are its con-

[1] The unit lens in the old French system is a double convex lens with radii of curvature equal to one Paris inch, which, with glass of an index of refraction equal to 1.5, would have a focal length also of one Paris inch. But the index of refraction of crown glass is actually about 1.53, which gives a focal length for this unit lens of about .94 Paris inch. Now, it happens that the value of the English inch, expressed in Paris inches, is also about .94, from which relation it follows that the number which expresses the radius of curvature in Paris inches expresses approximately the focal length in English inches; in fact, this approximation is very close, and the error so small as to be practically inappreciable.

[2] Klinische Monatsblätter für Augenheilkunde, IV., p. 1.

[3] Archiv für Ophthalmologie, XII., ii., p. 309.

[4] This corresponds to a focal length of one metre for the glass ground with two spherical surfaces of forty Paris inches radius, and is so nearly exact that the No. 40 of the French scale may be, and is, used by opticians as the equivalent of the

venient size, its conformity to the numbers of glasses as ordinarily manufactured, and to Donders' measure, $\frac{1}{24}$, which has become familiar through his writings, and the fact that the numbers 48 and 120 are both divisible by six and by eight, without remainders, and that 120 is similarly divisible by ten also.

At the same meeting, Nagel dissented from Javal's recommendation, and proposed as the unit a lens of one metre focal length, but with half-unit intervals between the limits .5 and 7. The whole series as recommended by Nagel consisted of 27 numbers.

The propositions of Javal and Nagel were referred by the Congress to a committee charged to report at Berlin in 1871.

At the meeting of the Congress in 1872, the committee presented a majority report favoring the adoption of $\frac{1}{96}$ as the unit, which is recognized as the practical equivalent of a lens of 240 cm. focal length. The whole series from 1 ($=\frac{1}{96}$) to 48 ($=\frac{1}{2}$) contains forty-eight numbers, but the committee proposed to reduce them to thirty-six by omitting alternate numbers above 24 ($=\frac{1}{4}$).

Nagel, still dissenting from the majority of the committee, has ever since advocated the adoption of the *metre lens* as the unit, and has at length succeeded in introducing the metric series into commerce, and into very common use, at least in Europe. With the distinguished approval of Donders, the metric trial case is now made up of quarter-units, between 25 and 3., half-units between 3. and 6., units between 6. and 16., and double units between 16. and 20. Thus the eighty numbers of the full series are reduced to thirty.

The writer has long been of the opinion that a smaller measure of refraction than is afforded by either of these systems is demanded in the interest of accurate work, and it is now suggested that an interval equal to one-tenth of the metric unit (about $\frac{1}{40}$ of the old French scale), or one-fourth of the unit $\frac{1}{96}$ ($=\frac{1}{384}$), is not too small to be of frequent use in careful measurements.[5] A series of 200 or of 192

metre lens. An experimental confirmation of the substantial accuracy of this assumed value has been recently given by Horstmann. (Klin. Monatsb. für Augenheilk., XVI., p. 290.)

[6] In an old trial case, made for the writer by Nachet in 1866, the initial glass is $\frac{1}{96}$, followed by $\frac{1}{84}$, $\frac{1}{72}$, $\frac{1}{60}$, $\frac{1}{48}$, $\frac{1}{42}$, $\frac{1}{36}$, $\frac{1}{30}$, $\frac{1}{24}$, etc., the intervals being $\frac{1}{672}$, $\frac{1}{504}$, $\frac{1}{360}$, $\frac{1}{336}$, $\frac{1}{252}$, $\frac{1}{180}$, $\frac{1}{120}$, etc. These small intervals, though not uniform, have proved very useful. They are easily utilized by making up a compound lens approximating the value required, in which one of these weaker lenses, either convex or concave, is introduced as a factor, and then exchanging the weaker lens for that next above or below it in the series.

numbers is, however, quite out of the question, owing as well to the cost and cumbrousness of so enormous a trial case, as to the fact that the grinding-tools for such a series are not in existence, and are not likely to be made. Nor can a series based upon so small a unit be compressed within convenient limits by any scheme for omitting an increasing number of units in the higher intervals. There remains then only the plan, long ago suggested by Zehender, of using glasses in combination, and for greater convenience, it may be well to limit such combinations to two glasses of a kind, and these of the same sign, *plus* or *minus*.

The following scheme is suggested for a full metric series of 210 numbers,[6] ranging from .1 to 21., together with such cylindrical glasses as may be requisite for the accurate investigation of astigmatism.

Series A.—29 numbers: common interval, .1; range, .1 to 21.

Spherical glasses, in pairs, convex and concave.—Nos. .1 .2 .3 .4 .5 .6 .7 .8 .9 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20.

Cylindrical glasses, single, convex and concave.—Nos. .1 .2 .3 .4 .5 .6 .7 .8 .9 1. 2. 3. 4. 5. 6. 7. 8.

Spherical glasses,	$29 \times 2 \times 2 =$	116
Cylindrical glasses,	$17 \times 2 =$	34
	Total,	150

[6] The manufacture of the glasses in this series between the limits .1 and .9 would appear at first sight to involve the preparation of a large number of special grinding-tools. This is, however, by no means absolutely necessary, for all the nine glasses may be easily and accurately made by using plane surfaces in connection with the convex or concave spherical curves of Nos. 1., .8, and .6. Taking the lens with double spherical surfaces of 40 Paris inches radius as the equivalent of the *metre lens*, the Nos. .8 and .6 will have surfaces of 50 and $66\frac{2}{3}$ inches radius respectively. Combining these curves severally with plane surfaces, we obtain Nos. .5, .4, and .3. Nos. .9 and .7 are double spherical lenses with radii of 40 and 50, and 50 and $66\frac{2}{3}$ inches, and Nos. .2 and .1 are similarly menisci with *plus* and *minus* surfaces of 40 and $66\frac{2}{3}$, and 40 and 50 inches radii respectively.

The cylindrical lenses, which for convenience of manufacture are always made in the plano-cylindrical form, will have the following radii of curvature in Paris inches: No. 1., 20 inches; No. .9, $22\frac{2}{9}$ inches; No. .8, 25 inches; No. .7, $28\frac{4}{7}$ inches; No. .6, $33\frac{1}{3}$ inches; No. .5, 40 inches; No. .4, 50 inches; No. .3, $66\frac{2}{3}$ inches; No. 2, 100 inches; and No. .1, 200 inches. Cylindrical glasses of these radii may be made with the greatest cheapness, and with all the accuracy desirable, by bending sheets of polished plate glass by the aid of heat, as is done on a large scale in the arts in preparing curved glass for windows. The bent glass is cut to the size required for a single lens, and a plane or spherical surface is ground upon either the convex or concave side, at pleasure.

The number of glasses in this series may be considerably reduced, without departing from the spirit of the metric system, by dropping alternate numbers in the decimal part of the scale, and so making the initial glass and the common interval equal to .2 instead of .1, as follows:

Series B.—19 numbers: common interval, .2; range, .2 to 22.

Spherical glasses, in pairs, convex and concave—Nos. .2 .4 .6 .8 1.0 1.2 1.4 1.6 1.8 2. 4. 6. 8. 10. 12. 14. 16. 18. 20.

Cylindrical glasses, single, convex and concave.—Nos. .2 .4 .6 .8 1. 2. 3. 4. 5. 6. 7. 8.

Spherical glasses,	$19 \times 2 \times 2 = 76$
Cylindrical glasses,	$12 \times 2 = 24$
Total,	100

This number may be still further reduced, though with a considerable sacrifice of convenience, by using convex and concave glasses together, in dual combinations; the series will then contain of

Spherical glasses, single, convex and concave,	$20 \times 2 = 40$
Cylindrical glasses, single, convex and concave,	$12 \times 2 = 24$
Total,	64

The interval one-fourth of the metric unit (.25 or about $\frac{1}{160}$ of the old French scale) appears to the writer to be less convenient in practice than the interval .2, besides being less in the spirit of the decimal system. Lenses ground upon this scale are, however, now readily procurable, and a set of seventeen glasses, selected from the new trial cases of Nachet and other European opticians, is sufficient to make up a full series between the limits .25 and 22.

Series C.—17 numbers: common interval, .25; range, .25 to 22.

Spherical glasses, in pairs, convex and concave.—Nos. .25 .50 .75 1. 1.25 1.50 1.75 2. 4. 6. 8. 10. 12. 14. 16. 18. 20.

Cylindrical glasses, single, convex and concave.—Nos. .25 .50 .75 1. 1.25 1.50 1.75 2. 4. 6. 8.

Spherical glasses,	$17 \times 2 \times 2 = 68$
Cylindrical glasses,	$11 \times 2 = 22$
Total,	90

Or, slightly vayring the selection:

Spherical glasses, in pairs, convex and concave.—Nos. .25 .50 .75, 1. 1.25 1.50 1.75 2. 2.25 2.50 2.75 3. 6. 9. 12. 15. 18.

Cylindrical glasses, single, convex and concave.—Nos. .25 .50 .75 1. 1.25 1.50 1.75 2. 2.25 2.50 2.75 3. 6.

Spherical glasses,	$17 \times 2 \times 2 = 68$
Cylindrical glasses,	$13 \times 2 = 26$
Total,	94

Or, using convex and concave glasses in the same combination:

Spherical glasses,	$18 \times 2 = 36$
Cylindrical glasses,	$12 \times 2 = 24$
Total,	60

The unit $\frac{1}{96}$ of the old French scale, as recommended by the Committee of the International Ophthalmological Congress of 1872, may be taken as the basis of a combination series without going beyond the numbers which can be furnished by any manufacturer who is provided with tools for grinding lenses upon the old French system, as follows:—

Series D.—13 numbers: common interval, $\frac{1}{96}$; range $\frac{1}{96}$ to $\frac{1}{12}$.

Spherical glasses, in pairs, convex and concave.—

Nos.	1,	2,	3,	4,	5,	6,	7,	8,	16,	24,	32,	40,	48.
	$\frac{1}{96}$	$\frac{1}{48}$	$\frac{1}{32}$	$\frac{1}{24}$	$\frac{1}{19.2}$	$\frac{1}{16}$	$\frac{1}{13.7}$	$\frac{1}{12}$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2.4}$	$\frac{1}{2}$

Cylindrical glasses, single, convex and concave.—

Nos.	1,	2,	3,	4,	5,	6,	7,	8,	16.
	$\frac{1}{96}$	$\frac{1}{48}$	$\frac{1}{32}$	$\frac{1}{24}$	$\frac{1}{19.2}$	$\frac{1}{16}$	$\frac{1}{13.7}$	$\frac{1}{12}$	$\frac{1}{6}$
or,	1,	2,	3,	4,	8,	12,	16.		
	$\frac{1}{96}$	$\frac{1}{48}$	$\frac{1}{32}$	$\frac{1}{24}$	$\frac{1}{12}$	$\frac{1}{8}$	$\frac{1}{6}$		

Spherical glasses,	$13 \times 2 \times 2 = 52$
Cylindrical glasses,	$9 \times 2 = 18$
Total,	70

Or,

Spherical glasses,	$13 \times 2 \times 2 = 52$
Cylindrical glasses,	$7 \times 2 = 14$
Total,	66

Or, using convex and concave glasses in the same combination—

Spherical glasses,	$14 \times 2 = 28$
Cylindrical glasses,	$7 \times 2 = 14$
Total,	42

This series may be made available for finer determinations by adding to it a single convex and concave glass of the values $+\frac{1}{19.2}$ and $-\frac{1}{19.2}$. The fractional numbers $\frac{1}{19.2}$, $\frac{1}{13.7}$, and $\frac{1}{2.14}$ may be easily and correctly made by grinding the glasses with surfaces of unequal radii, viz., 24 and 16, 16 and 12, and 3 and 2 Paris inches respectively. Of the cylindrical glasses the second list contains no fractional or unusual numbers.

Trial glasses, to be used in combinations as here suggested, should be set in metallic rings, such as were long ago introduced by Nachet. These settings have a thin projecting rim, like the flange on the wheel of a railway carriage, which is in the same plane with the most prominent part of one of the surfaces of the glass. Two glasses may thus be held with their rims in contact, and the two may be placed together in a single rather broad groove in the trial frame.[7] A second broad groove suffices in the same way to hold any combination of two cylindrical glasses that may be needed to correct any grade of astigmatism. These two broad grooves are separated by an interval of about four millimetres, in which interval an intermediate groove may be cut. The whole system of grooves, with their separating and retaining ridges, occupies a width of about twelve millimetres, and the weight of the trial frame, substantially made of hammered brass or nickel silver, is about twenty-five grammes. The ordinary double convex and double concave lenses are thinner than plano-spherical lenses of the same diameter, as suggested by Zehender, and are therefore to be preferred. It is also true that the thickness of any combination of the glasses in the trial case, when set nearly or quite in contact with each other, is but little greater than that of a single glass of the same formula.

[7] The writer has used for a dozen years past a trial frame made with a broad groove holding two of the glasses from Nachet's trial case, and has found it very convenient.

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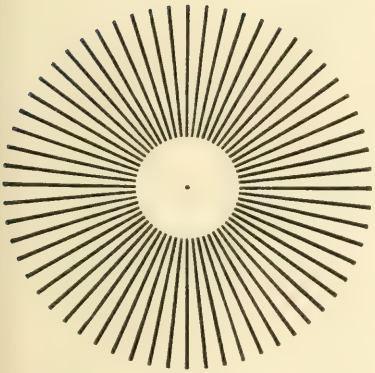
I
II
III
IV
V
VI
VII
VIII
IX
X
XI

A



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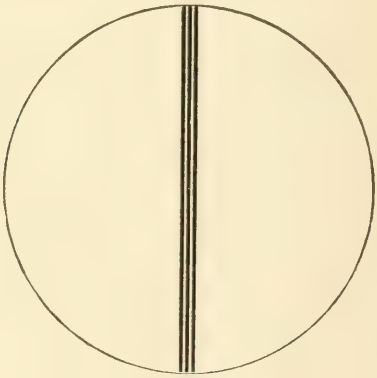

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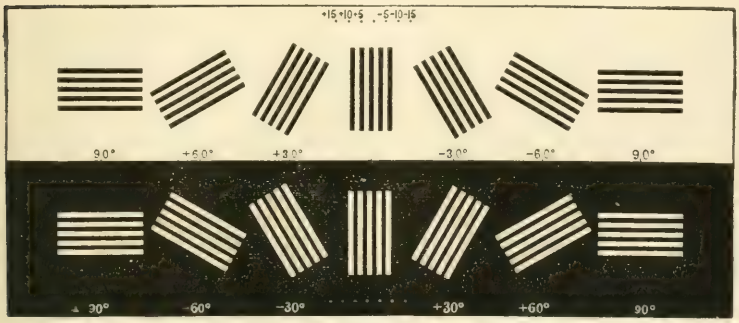
+15 +10 +5 -5 -10 -15
90°
+60°
+30°
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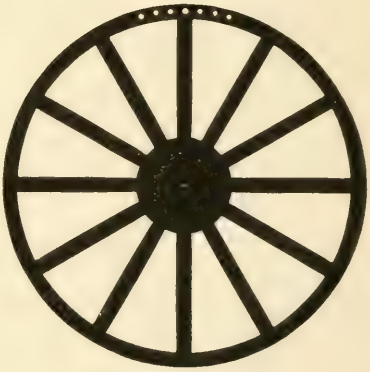

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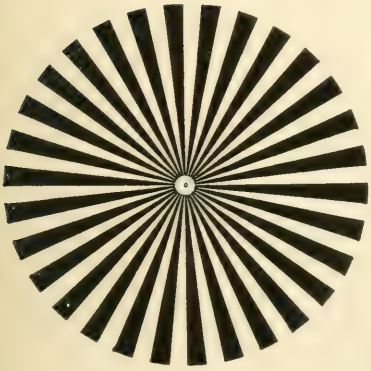

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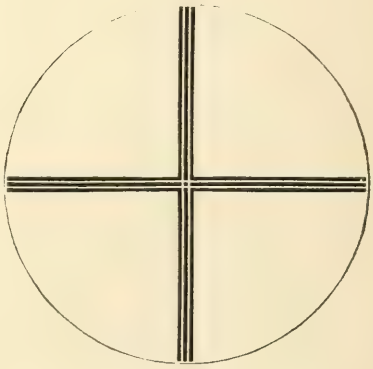

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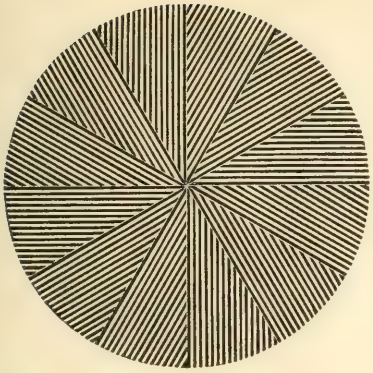

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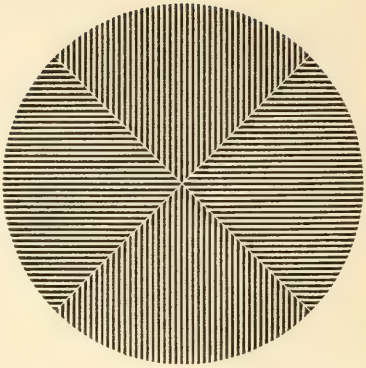

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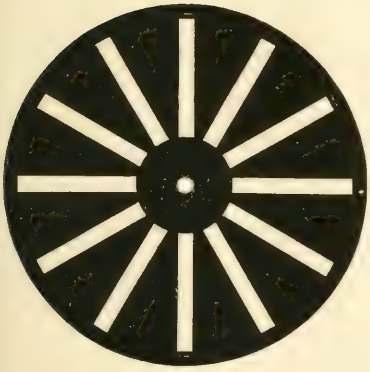

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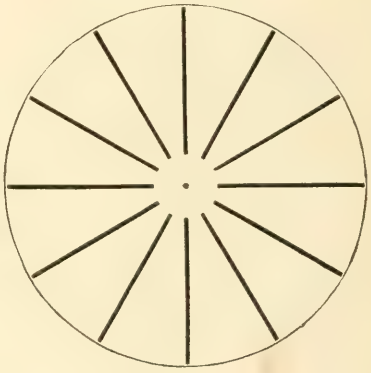

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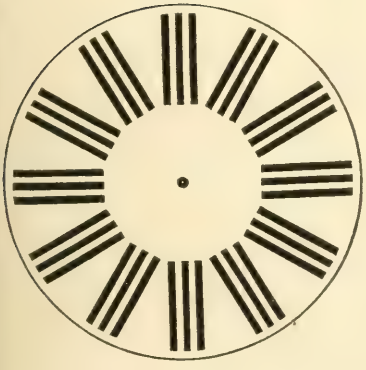

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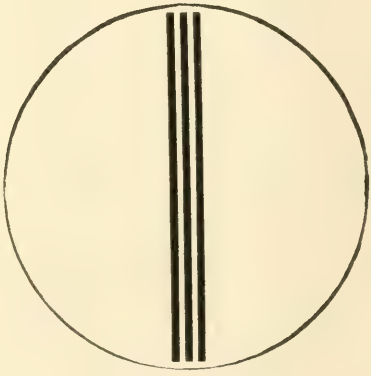

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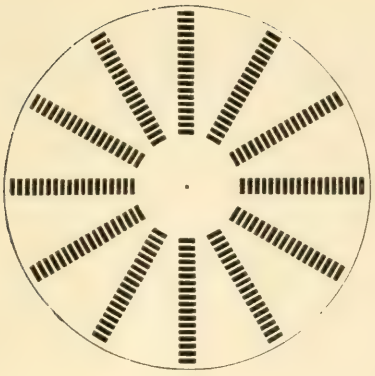

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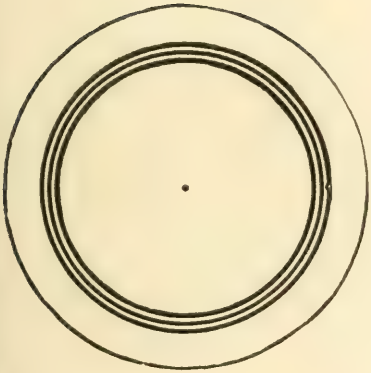

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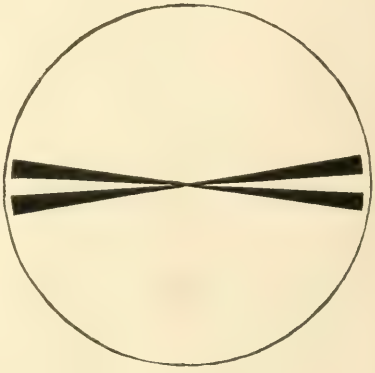

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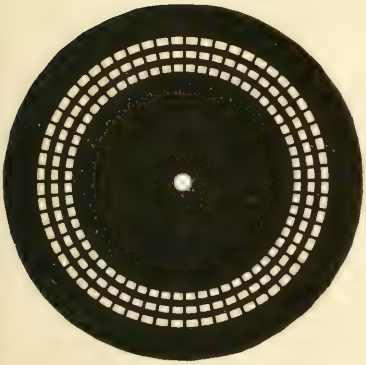

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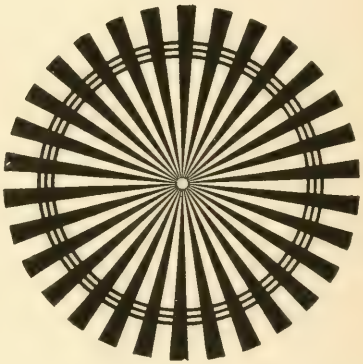

Z

XX

Printed from a negative taken from Fig. X, with a diaphragm in the lens of the camera, and a cylindrical lens added. The effect is approximately that presented by As=1-12, with a moderately contracted pupil.

YY

From a negative taken from Fig. Y, without diaphragm, and with a cylindrical lens of half the power of that used in the case of Fig. XX. The effect is approximately that produced by As=1-24, with a moderately dilated pupil.

Heliograph of Robert Benecke, St. Louis, Mo.

A NEW MODIFCATION OF THE OPHTHALMOSCOPE.

By Edward G. Loring, M.D., New York.

Of the making of ophthalmoscopes there is no end, and even the most enthusiastic specialists are heartily tired of the whole matter. The writer would not therefore have taken the liberty of calling the attention of the Society to still another, if, after two years' experience, he had not felt convinced that the one now proposed possessed some merits worthy of a brief notice, and if he had not wished, in taking leave of a subject on which he had spent too much time already, to mention some points in the construction of an instrument which had been brought to his consideration in his various experiments and trials.

Whatever the rest of the world may think, I myself am grateful for even the modification of the last thread of the last screw. For, however trifling, or even finikin, the individual alteration may have been, my own among the number, I am convinced that the general result of so much competition in perfecting one of the most beautiful instruments known in medicine, has been the means of changing the method of examination from the almost exclusive use of the inverted image, to that of the comprehensive method of the upright image.

The first essential point is that the glasses should have a diameter of not less than six millimetres. To maintain this diameter, and to get at the same time a sufficient selection of glasses, we must either have an enormously large single disk, like Dr. Knapp's, of 56 mm. diameter, or a number of disks. The broadest diameter possible for the well-working of a disk is forty four millimetres. The greatest number of perforations which such a disk as this can contain is sixteen, which, though sufficient for all ordinary work, is not enough for the higher degrees of ametropia.

The remedy for this state of affairs has hitherto been sought in two principal ways, either in separate or detachable disks, as in my earliest instrument and those directly copied from it, or in two superimposed disks, of which Landolt's ophthalmoscope may be considered a principal example.

Many years ago (1871) I constructed a combination ophthalmoscope with two superimposed disks, and discarded it on account of the objections which such a plan must invariably present; since.

when two entire disks are used, we must, in order to obtain any simple number, turn both disks every time to zero, without which the combination cannot be dissolved, for, as soon as one glass is revolved away from its position, another falls into its place. Nor can we turn at a moment's notice from plus to minus, and back again from minus to plus. Moreover, the necessity of progressing in a regular series of half-dioptrics to get small intervals in the weaker numbers, becomes useless and wearisome among the higher ones, and necessitates a great amount of turning. To all of which is added, moreover, the difficulty of notation, and the fact of this being recorded on both

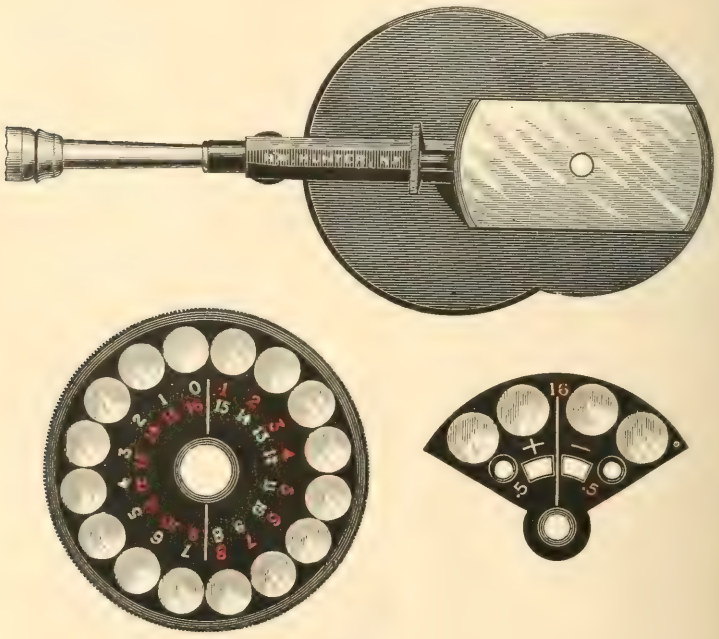

Fig. 1.

sides of the instrument. The result of all this is a hopeless confusion as in Landolt's and similar instruments, which is as wearisome to the observer as to the patient. To obviate these objections as far as can be, the following arrangement, which differs from that other ophthalmoscopes hitherto proposed, in many important particulars, has been adopted:

This consists of a single disk and a segment of a disk, as shown in the drawing, Fig. 1.

In the present case a quadrant of a circle is used; this might, however, be made larger or smaller, if required.

The single disk contains sixteen glasses on the metric system, the plus being numbered in *white*, and the minus in *red*.* The first row of numbers, or that just beneath the glass, shows the *real* value of the glass; the second, or inner row, shows the result of the combinations when the quadrant is in position. The quadrant rotates immediately over the disk and around the same centre, and contains four glasses — .5 — 16. and + .5 + 16.

When not in use the quadrant is beneath its cover. The instrument then represents a simple ophthalmoscope with sixteen perforations, the series running with an interval of 1.D, and extending from 1 to 7. plus, and from 1. to 8 minus.

This is ample for all ordinary work, as the interval of 1.D is as close as even an expert usually desires, and can, with a little experience, be used for even very minute discrepancies. For if in a given case the fundus is seen distinctly with 1.D and a little to spare, while 2.D blurs the picture, we know at once that the refraction must be between the two, or 1.5 D. If, however, for any reason we wish to prove this conclusion, we can bring up 0.5 D. From this glass we get successive half-dioptrics from 1 to 8. plus, and from 1 to 9. minus. In this way we have, so to speak, a fine and coarse adjustment, as in the microscope.

If the higher numbers are desired, these are obtained by combination with those of the quadrant. These progress regularly up to 16D, every dioptric being marked upon the disk; above this, up to + 23D and — 24D, we have to simply add the glass which comes beneath the 16D, turning always in the same direction.

* Owing to the small body of ink which the types are capable of holding, the contrast between the red figures and the black background in the drawing is not nearly so marked as in the real instrument. In this latter, the bright scarlet figures produced by actual pigment, are even more vivid and brilliant than the white, especially under gas-light.

Beginning with 0, and revolving always from left to right, we obtain :

PLUS			Beginning with 0, and revolving always from *right* to *left*, we obtain.	MINUS
	0			1
	1			2
	2			3
	3			4
	4			5
	5			6
	6			7
	7	Bring up + 16		8 Bring up − 16
+ 16 − 8 =	8		− 16 + 7 =	9
" − 7 =	9		" + 6 =	10
" − 6 =	10		" + 5 =	11
" − 5 =	11		" + 4 =	12
" − 4 =	12		" + 3 =	13
" − 3 =	13		" + 2 =	14
" − 2 =	14		" + 1 =	15
" − 1 =	15		" + 0 =	16
" 0 =	16		" − 1 =	17
" + 1 =	17		" − 2 =	18
" + 2 =	18		" − 3 =	19
" + 3 =	19		" − 4 =	20
" + 4 =	20		" − 5 =	21
" + 5 =	21		" − 6 =	22
" + 6 =	22		" − 7 =	23
" + 7 =	23		" − 8 =	24

Thus, with the superposition of a *single* glass (+ 16 or − 16), and with an uninterrupted rotation, a series is obtained of successive dioptrics from 1 to 23 plus, and from 1 to 24 minus.

With the use of the 0.5 we can obtain in addition the following series with an interval of half a dioptric :

+ 0.	− 0.5
+ 0.5	− 1.
+ 1.	− 1.5
+ 1.5	− 2.
+ 2.	− 2.5
+ 2.5	− 3.
+ 3.	− 3.5
+ 3.5	− 4.
+ 4.	− 4.5

+ 4.5	— 5.
+ 5.	— 5.5
+ 5.5	— 6.
+ 6.	— 6.5
+ 6.5	— 7.
+ 7.	— 7.5
+ 7.5	— 8.
+ 8.	— 8.5
	— 9.

Making a total series of sixty-five glasses. Should the combination at any moment not be wanted, a trifling displacement of the quadrant to either side of the mirror-hole at once dissolves it, and the instrument becomes a single-disk ophthalmoscope.

In this manner an enormous quantity of glasses can be placed at our service, in case of need, without our being compelled to use them on all occasions, or to turn through them in our search for a particular glass. The fear that by a combination of two glasses the quantity of the light would be diminished has not been realized, and I have frequently got a good view of the fundus with — 24 D ($\frac{1}{1.5}$ old style), which is the severest test which can be applied. Indeed, I have never used an instrument in which I obtained so much light for the upright image. This may be due in part to the extreme thinness of the glasses, the strongest being less than half a millimetre thick.

The mirror shown in the drawing is the "tilting" mirror. If preferred, however, the "three-quarter" mirror or the common circular mirror can be employed.

For a description of these mirrors, the reader is referred to the author's paper in the Report of the Fifth International Ophthalmological Congress, 1876, p. 85. In regard to the advantage of a mirror set at an angle for the use of the upright image, there can be no possible doubt in the mind of any one who has once seen the difference, in the ease of the illumination and the clearness and brilliancy of the picture. By their use, a large quantity of light is saved, since the correcting glass, instead of being at a considerable angle with the axis of vision, and therefore in a position favorable to a largely increased loss of light through reflection from the surface of the glass, is nearly at right angles to it, by which all the light possible is saved. This mirror gives also ample light for the inverted image, and I now use it entirely for all methods of examination.

The instrument is made with or without a cover for the posterior surface of the glasses. As a matter of fact, the glasses can be kept

cleaner when the posterior surface is not covered than when it is, provided that, as in the present case, they are protected by a rim.

Fig. 2 represents the same instrument with a different method of notation, consisting of two concentric rows of figures, the outer row being the plus and the inner the minus.

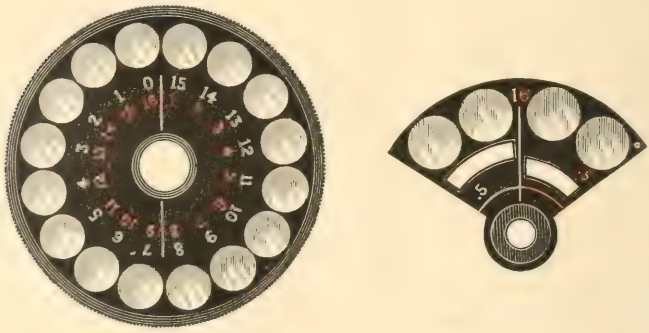

Fig. 2.

This is certainly the more elegant form of the two, the only possible objection to it being that the *real* value of the glass is not always immediately below the glass itself, its place being sometimes occupied by the equivalent of the combination. No confusion can, however, occur, as the plus and minus numbers have distinctive colors, and progress in different directions—the red from right to left, and the white left to right.

In closing, I cannot forbear from calling attention to the exquisite delicacy, yet strength, of the work, which far surpasses anything I had supposed possible. The instrument is to be had of its maker, W. H. Hunter, 1,132 Broadway. Price, $35.

THE ÆTIOLOGY OF RETINITIS PIGMENTOSA, WITH CASES. By Dr. David Webster, New York.

Mr. Jonathan Hutchinson, in the *Ophthalmic Hospital Reports*, Vol. VII., page 435, says: "An ophthalmic surgeon, who may chance upon a good example of this rare malady, and may not feel inclined to trouble himself about it farther than the limits of his own specialty, is bound in the interests of general medicine to hand it over for investigation to some naturalist of wider sympathies."

In regard to the ætiology, he says: "There cannot be the slightest doubt that it is remarkably hereditary," and that "cases which favor the belief that consanguineous marriages may produce a tendency to it are of special value." He further states that "inherited syphilis may produce changes exceedingly like those of retinitis pigmentosa, but to be distinguished from the true disease on careful examination."

Stellwag tells us that "in a series of cases the disease has proved to be hereditary," and that "statistics show that it occurs much more frequently in children whose parents were blood-relations, than otherwise."

Schweigger says: "Heredity is an important element in the ætiology of the disease," and, without stating the results of his own observations, tells us that "more comprehensive statistics with reference to the matter of consanguinity are desirable."

Carter has never met with a case of retinitis pigmentosa in which any relationship between the parents existed, but generally finds more than one in the same family similarly affected. He has never been able to connect the disease with syphilis, either inherited or acquired.

Macnamara informs us that consanguinity of parentage cannot be the cause of the disease among the natives of India, as they are most scrupulous in observing the restrictions they place upon the intermarriage of relations, and yet he has seen some twelve or fifteen instances of it among his native patients within a period of one year. He says the disease is hereditary, and occurs frequently in several members of the same family; he is also disposed to look upon it, in some cases, as the result of inherited syphilis.

Wells says the disease is often hereditary, but seems to found his opinions entirely upon the observations of others.

Liebreich was the first who called attention to consanguinity of parentage as a cause of retinitis pigmentosa, and we do not wonder that he believed he had made a valuable discovery when we are told that in fourteen out of thirty-five cases he was enabled to prove a descent from blood-relations.

Mooren noted consanguinity of parentage in nine out of thirty-four cases.

Leber, in "*Handbuch der gesammten Augenheilkunde*," Vol. II., page 653, reports sixty-six cases of retinitis pigmentosa observed by himself. Forty-four were of the usual kind, while twenty-two were complicated with congenital atrophy of the retina. He found consanguinity of parentage in eighteen cases, or 27.3 per cent.; the disease affecting other brothers or sisters in fourteen cases, or 21.2 per cent.; heredity in one case, or 1.5 per cent.; hereditary syphilis in five cases, or 7.6 per cent.; and in twenty-eight cases, or 42.4 per cent., no cause could be ascertained.

We should infer from the observations of Liebreich, Mooren, and Leber, that consanguinity of parentage was one of the most frequent causes of the disease, and yet many other observers have failed to find it in any case.

In the report of the Wiesbaden Eye Infirmary for 1861–2, twelve cases of retinitis pigmentosa are given, and in not one was any consanguinity of parentage traceable.

Lawrence and Moon report four cases in the *Ophthalmic Review* for 1866—three boys and a girl in the same family. There was no consanguinity of parentage or traceable syphilis in the family.

Mr. Hutchinson reports four cases, none of whom showed consanguinity of parentage. In one case there was heredity, two of the patients being father and daughter.

Harlan, of Philadelphia, has reported a case, a girl of eighteen, without consanguinity of parentage, heredity, or inherited syphilis.

My friend, Dr. W. Cheatham, of Louisville, Kentucky, has been kind enough to furnish me with the following most extraordinary history of a family afflicted with this disease. He says: "I was called, lately, to see a case of cataract that had been operated on seven weeks previously. On examination I found dark-colored cataract of the right eye. The pupil of the left eye was closed, and the eyeball was very tender to the touch, and quite painful. Both visual fields, as tested by a lighted candle in a dark room, were contracted to almost nothing.

"On getting the history of the case, that of the whole family

was given, extending back for a period of over two hundred years. Thinking, from the history of the patient, that the eye trouble from which the family suffered was retinitis pigmentosa, I requested that some of them should submit to an ophthalmoscopic examination. Two gentlemen of the family called at my office the next day. The examination revealed well-marked retinitis pigmentosa in both cases. They were kind enough to give me a full history of their family, one branch of which can be traced directly to Pocahontas. The disease had been in the family for over two hundred years. A peculiar feature of it, as it existed in them, was that it attacked about one half of them only. It appeared to select about every other one. For instance, one member of the family had nine children. The first one born had the disease, the second one it missed, the third had it, and so on through the whole of the nine children.

"Another interesting feature is, as soon as twilight sets in, the blindness usual in such cases begins, yet, by bright moonlight, some of them are able to read the finest print; but the instant they get into the slightest shade the hemeralopia again appears. Again, there has been but one intermarriage in the family, and the children of this couple are the only ones all of whom are entirely exempt from the disease, all the others, as I said before, having about every other one attacked by it!"

Dr. Cheatham informs me that the family whose history is related above is "one of the most numerous in the South." It certainly demonstrates, beyond all reasonable doubt, the hereditary nature of retinitis pigmentosa.

I have succeeded in collecting from the case-books of Dr. C. R. Agnew, with his kind permission, nineteen cases in which the records were tolerably complete, and, adding to these three cases which I saw in Massachusetts, I am enabled to present to the Society the histories of twenty-two cases, nearly all of which I examined personally.

Inspection of these cases will show that consanguinity of parentage was traceable in only three out of the twenty-two cases, or in 13.6 per cent. Possibly this does not very much exceed the general percentage of intermarriages of blood-relations in the United States, and when we observe that in one of the three cases heredity undoubtedly existed, the mother having always seen much worse than other people after dark and in darkened rooms, and that in another of them a suspicion of heredity exists, the mother having long been subject to weak eyes, and that in the third case the patient was a

deaf mute, we are inclined to the opinion that consanguinity of parentage, if at all, is a comparatively weak element in the causation.

Heredity was present in seven cases, or in 31.8 per cent., and there was good reason for suspecting heredity in several other cases, but it could not be proved.

Three of the patients were members of the same family, and three others had brothers, sisters, or cousins with the same disease.

One patient had a daughter with an appearance and history which would lead one to suspect inherited syphilis.

One patient attributed the disease to his having been struck by lightning at the age of eight.

Two of the patients were deaf-mutes.

One or two of the patients had relatives with various diseases of the nervous system.

In six cases no cause was ascertained, there being no heredity, no consanguinity of parentage, and no history of nervous diseases in their families.

I append, in full, the notes of the twenty-two cases, as some of them contain points of interest aside from the causation.

CASE I.—Ella P., 16. First noticed night-blindness five or six years ago. She sees well in the day-time, and in the night can see to read and write by gaslight, but cannot see well enough to get about alone. Vision = $\frac{2}{200}$ each eye; no improvement with glasses.

Ophthalmoscopic Examination.—Each eye H. $\frac{1}{24}$. Retinitis pigmentosa and partial atrophy of optic nerve, both eyes; slight posterior polar cataract right eye.

Her father and mother are first cousins. Her mother has always had weak eyes.

CASE II.—S. Q., 16, deaf-mute. Has vision = $\frac{2}{10}$, each eye, and no improvement with glasses. His visual fields are greatly contracted.

The ophthalmoscope shows H. $\frac{1}{10}$ each; retinitis pigmentosa with atrophy of optic nerves and retinæ.

His father and mother are cousins.

CASE III.—Oct., 1868. Frederic S., 20. Since childhood, or as far back as he can remember, he has not been able to see well in the dark. He has to be led about after dark. He can see by gaslight as well as by day. He has never suffered from pain or other trouble in the eyes. His parents were first cousins, once removed.

His mother has always seen badly at night, or in a darkened room, and has remarked especial difficulty in getting up and down the stairs in hall-ways that were not well lighted. She has, however, no pigment deposits in her retinæ, and seems to be one of those cases of "retinitis pigmentosa without the pigment," that have lately been described. The patient's grandmother is over 90, and reads the finest print without glasses, and yet is said not to be near-sighted.

Ophthalmoscopic Examination.—Typical retinitis pigmentosa; the retina looks hazy, especially near the optic nerve; the retinal vessels are diminished. Vision = $\frac{20}{20}$ (−) with − $\frac{1}{48}$ each eye; acc. = $\frac{1}{5}$; no insufficiency of ocular muscles.

Feb. 1, 1878.—V. = $\frac{20}{30}$ each, and not improved by glasses. Each visual field reduced to an area of about four inches in diameter at a distance of one foot.

The patient was placed upon daily hypodermic injections of a solution of nitrate of strychnia, commencing with gr. $\frac{1}{40}$ and gradually increasing the dose until, on Feb. 11th, the physiological effects of the drug were produced. Neither central vision nor the visual field was appreciably affected by it, and the patient was dismissed with an unfavorable prognosis.

CASE IV.—April 30, 1878. Mrs. T. H. M., 42. Has always had poor vision with hemeralopia, and lately it has been growing worse. R.V. = $\frac{20}{100}$; no improvement with glasses. L.V. = $\frac{20}{100}$; V. = $\frac{20}{80}$ with + $\frac{1}{16}$.

The limitation of the visual fields is not concentric, but very irregular, and there are numerous scotomata.

Ophthalmoscopic Examination.—Both eyes H. $\frac{1}{16}$; the right retina is loaded with pigment deposits of all sorts, sizes, and shapes; the left shows the same appearances, but in less degree. There is partial atrophy of both optic nerves.

The patient's father and mother were both of the same name, but not related to each other. She has three sisters and a brother living. The brother has impaired vision, with eyes which the patient states "are just like hers, only not so bad." The three sisters see well. Her father's brother married his first cousin and had nine children. Three of these became blind and afterwards idiotic; a fourth had good sight, but was attacked with scrivener's palsy, and some years later died of a disease of the nervous system.

Mrs. M. was placed upon injections of nitrate of strychnia, commencing with gr. $\frac{1}{24}$.

May 1.—Has had a great deal of pain in left eye since her visit to

us yesterday. There is some deep injection of the eyeball. Ordered to bathe the eye frequently, and injected nitrate of strychnia, gr. $\frac{1}{20}$.

May 2.—The pupil of the left eye is irregular, showing adhesions, and there is a moderate amount of pericorneal injection, showing the existence of iritis. A solution of sulphate of atropia (gr. iv. ad ℥ j.) was dropped into the eye four times while the patient remained in the office about an hour, but failed to dilate the pupil regularly. Injected strychnia, gr. $\frac{1}{17}$.

May 3.—Patient states that after she left the office yesterday her mouth and throat became dry, her head felt full and heavy, and she "went sound asleep" in the horse-car going home, and fell asleep in a chair after she got home. The pupil is widely and evenly dilated, and the redness has disappeared. Injected strychnia, gr. $\frac{1}{15}$.

May 15.—The patient has had a daily injection of strychnia. One-ninth of a grain was injected to-day, and produced some stiffness of the limbs. Her vision remains unchanged.

CASE V.—Sept. 12, 1873.—Mrs. E. L. J., æt. 53, states that seven or eight years ago a blur began in her right eye after a great shock to the nervous system in the death of a daughter. During the four weeks previously she had been deprived of sleep and constantly in the sick-room. Had a second daughter ill who died last summer. Has wept much and evidently been greatly shocked in her nervous system. Reads J. No. 15 very slowly, picking out letters at 11″ with glasses. Ophthalmoscopic examination shows retinitis pigmentosa. Injected strychnia, gr. $\frac{1}{24}$, and a few minutes later patient reads J. No. 12.

Sept. 15.—A few minutes after injecting strychnia, gr. $\frac{1}{24}$, patient reads J. No. 5.

Her husband writes, under date of May 10, 1878: "My wife died two years ago. Her sight continued gradually to fail, until it became difficult for her to get about without assistance. Her father and mother were not related to each other. Her older brother, who died some years ago, was troubled with imperfect vision, more especially I think at night. I never knew any other member of her family who was affected in that way."

CASE VI.—Jan. 13, 1874.—Mr. C. Z. L., æt. 25, law student, always had an imperfection of vision, near-sightedness, and difficulty of seeing in the night. Otherwise, eyes seemed quite strong. In Aug., 1871, first noticed clouds floating through visual field; moving his eyes would set them in motion, and when the eyes were fixed they would settle down and disappear. Soon after waves of light

commenced to sweep across his eyes, and have continued to do so up to the present. For more than a year he has had a constant appearance as of the flickering of candles. Since last winter he has had, once or twice a week, appearances like a ball of fire passing across the field of vision. Occasionally a small black spot surrounded by a ring of light is seen for a few moments.

No consanguinity of parentage. Mother died of consumption; father of dropsy. Has two brothers and two sisters. One brother and one sister have imperfect sight.

R.V. = $\frac{2}{50}$; L.V. = $\frac{2}{50}$; no improvement with glasses. Visual fields greatly contracted. Reads J. No. 1 at 9″ with each eye.

Ophthalmoscopic Examination.—Fundus beautifully besprinkled with the characteristic changes. Pigment patches, increasing in size and frequency in the periphery, some running over the vessels. There is a vessel in fundus of right eye, above the optic disc, which is a streak of pigment as far as it can be traced. There is thinning of the choroid in places, and the nerves have a somewhat atrophied look.

Injected strych. nitrat., gr. $\frac{1}{24}$. Before the injection he read J. D. V. and I. in $\frac{2}{50}$, but could not read the four intervening letters with each eye; five minutes after, he read all the letters in $\frac{2}{50}$, and T. P. and Z. in $\frac{2}{40}$ with each eye under the same conditions. The injection made him dizzy.

Jan. 14.—Injected strych. nitrat., gr. $\frac{1}{12}$, but no appreciable improvement of vision followed.

CASE VII.—A. C., æt. 44, manufacturer. Was always subject to night-blindness, but only a few years since began to notice impairment of vision in the day-time. A few years ago he got hot lead into his right eye, and has not been able to read with it since. His mother is subject to night-blindness. His maternal aunt has two children who are subject to night-blindness. His maternal uncle has one child with night-blindness. The patient has three sisters, all subject to night-blindness, thus making eight in the same family, all victims of this disease. R.V. = $\frac{2}{200}$; L.V. = $\frac{2}{30}$; no improvement with glasses. Visual fields about circular, and very small.

Ophthalmoscopic Examination.—Retinitis pigmentosa very marked in both eyes; right eye has also posterior polar cataract and floating bodies in the vitreous.

No consanguinity of parentage.

CASE VIII.—Miss M. C., æt. 16. Has for five years been the subject of night-blindness and gradually deteriorating vision.

R.V. $= {}_{2}{}^{4}{}_{0}{}_{0}$; L.V. $= {}_{\frac{1}{4}}{}^{4}{}_{0}$; no improvement with glasses. Fields extremely small. No heredity or consanguinity of parentage traceable.

Ophthalmoscopic Examination.—Periphery of each retina sprinkled with the deposits characteristic of retinitis pigmentosa. Optic disks and adjacent choroid show evidences of atrophy.

At the age of eight this patient was struck by lightning, and rendered insensible for a few moments.

CASE IX.—George L., æt. 14, deaf-mute, and always subject to night-blindness. V. $= \frac{2}{4}{}^{0}{}_{0}$ each; no improvement with glasses; visual fields concentrically limited.

Ophthalmoscopic Examination.—Retinitis pigmentosa, with partial atrophy of optic nerves. No consanguinity of parentage or heredity traceable.

CASE X.—Joseph B., æt. 60, laborer. States that he saw as well as he *ever* saw, but not as well as other people, up to two years ago. He has always seen much worse at night and on cloudy days. Blindness came on very gradually. R.V. $= \frac{4}{\text{fingers}}$; L.V. $= \frac{\frac{1}{2}}{\text{fingers}}$; no improvement with glasses. Visual fields reduced to one inch each in diameter, at one foot. No heredity or consanguinity of parentage.

Ophthalmoscopic Examination.—Retinitis pigmentosa with atrophy of optic nerve, and polar cataract in both eyes.

CASE XI.—Mrs. W. P. E. M., æt. 40. Has R.V. $= \frac{2}{4}{}^{0}{}_{0}$ with $-\frac{1}{4\frac{1}{2}}$; L.V. $= {}_{2}{}^{1}{}_{0}{}_{0}$; no improvement with glasses.

Ophthalmoscopic Examination.—Retinitis pigmentosa of both eyes, with atrophy of left optic nerve. No consanguinity of parentage.

The patient brings her daughter for examination. She is aged 17, and has an eroded, moth-eaten look at the angles of her mouth, and a constriction around the middle of her forehead. She had keratitis following scarlatina at the age of ten. When 11 months old, she had paralysis of her left side, and she still walks heavily on that side. She now has opacities of both corneæ, staphyloma posticum, and disseminated choroidal atrophy of both eyes, and floating bodies in left vitreous.

CASE XII.—Ernest G., æt. 24, theological student. States that his sight became weak at about 9 years of age. His father and mother are not related, and he knows of no heredity.

R.V. = cannot count fingers correctly, but has a visual field one inch in diameter at one foot.

L.V. $= \frac{4}{200}$; visual field two inches in diameter at one foot. Both visual fields very nearly circular.

Ophthalmoscopic Examination.—Retinitis pigmentosa, with posterior polar cataract, and partial atrophy of optic nerve, both eyes.

CASE XIII.—Mrs. B. F. F., æt. 34. R.V. $= \frac{20}{40}$; L.V. $= \frac{20}{100}$; no improvement with glasses. Visual fields concentrically contracted.

Ophthalmoscopic Examination.—Retinitis pigmentosa of both eyes.

Father and mother were not related, and had only two children, both girls. Patient's sister is very short-sighted. She has one paternal uncle who is very short-sighted, but no other relative with defective vision in a very large circle of connections. Her mother died suddenly, without previous illness, at the age of 47.

CASE XIV.—Mrs. J. H. M., æt. 50. Has been near-sighted from childhood; has had asthenopia for two years, and is growing worse. She has slight conjunctivitis.

R.V. $= \frac{5}{100}$; V. $= \frac{20}{40}$ with $- \frac{1}{9}$.

L.V. $= \frac{20}{60}$; V. $= \frac{20}{30}$ with $- \frac{1}{12}$.

Both visual fields are limited.

Ophthalmoscopic Examination. — Retinitis pigmentosa, the pigment deposits being principally in the temporal part of the periphery of each fundus.

No consanguinity of parentage or known heredity.

CASE XV.—O. L. W., æt. 58, machinist. Sight began to fail twenty years ago, and he has not been able to read for ten years. He never has pain in his eyes, except when out in the wind. He sees objects, but fails to count fingers correctly with either eye.

Ophthalmoscopic Examination.—Retinitis pigmentosa, with atrophy of optic nerve, both eyes.

No consanguinity of parentage, syphilis, or known heredity.

CASE XVI.—Miss M. C., æt. 15. Has always had rather poor vision, and never could see well in the night, or in a darkened room. Her sight has failed lately.

R.V. $= \frac{20}{40}$; L. V. $= \frac{20}{70}$; no improvement with glasses. Both visual fields greatly concentrically contracted.

Ophthalmoscopic Examination.—Retinitis pigmentosa, with marked absence of pigment in its normal position in the retina.

No heredity or consanguinity of parentage traceable.

CASE XVII.—M. E., æt. 30, carpenter. Never noticed any trouble with eyes till five or six years ago, and then first began to have difficulty in getting about at night. It increased up to about a year

ago, since which it has been at a standstill. Things began to blur about a year ago.

R.V. = $\frac{3}{20}$; Hm. $\frac{1}{36}$. L.V. = $\frac{3}{20}$ (−) E.

Visual field, right, most of upper half gone; left, only infero-temporal quadrant remains.

Ophthalmoscopic Examination.—Retinitis pigmentosa well-marked in both eyes.

No consanguinity of parentage, and the patient never heard of any cases of poor eyesight in the family.

CASE XVIII.—J. R. P., æt. 44, farmer. Lost right eye when a boy; when eight years old happened to close left eye, and found himself in darkness. Sight in left eye began to fail noticeably fifteen months ago, and he has not been able to read for five months. There is smarting and stinging of the left eye.

R.V. = counts fingers in extreme temporal portion of field. L.V. = $\frac{3}{60}$; no improvement with glasses. Visual field limited concentrically.

Ophthalmoscopic Examination.—Retinitis pigmentosa, with choroiditis of both eyes.

He has been treated with mercurials, leeches to temples, and strychnine injections, without benefit.

No consanguinity of parentage. Maternal grandfather had seven children. The families of five have had more or less trouble with their sight. Of his father's eight children, patient's eldest sister and himself are the only ones affected with retinitis pigmentosa.

CASE XIX.—Mrs. S. W., æt. 32. Has had weak eyes for over a year, and has not been able to use them to any extent in reading or sewing.

V. = $\frac{3}{20}$ each; E.; no insufficiency. Ophthalmoscope shows delicate changes about the macula, and an extensive plaque of the changes characteristic of retinitis pigmentosa in the periphery infero-nasally from disk. No limitation of fields. No consanguinity. Mother has atrophy of optic nerves, and a sister is near-sighted.

CASES XX., XXI., and XXII.—In 1876 I became acquainted with a family in Massachusetts by the name of B——, three members of which were afflicted with retinitis pigmentosa, and possibly a fourth, whose eyes I had no opportunity of examining.

(20). The eldest brother, now 49 years old, having always had poor sight, became totally blind at the age of 25. Ophthalmoscopic examination showed the characteristic pigmentary deposits scattered

over the whole fundus, atrophy of the optic nerve, and posterior polar cataract in both eyes.

(21). A younger brother, now 30 years old, could see sufficiently well to do a farmer's work up to the age of 15. He can still see to find his way about. He has retinitis pigmentosa, with atrophy of optic nerve, and posterior polar cataract, of both eyes, the same as his brother. Neither of the brothers is married.

(22). The third is a married sister, 46 years of age. Although the subject of marked retinitis pigmentosa in both eyes, she still retains sufficient sight to do her own housework. She has neither polar cataract nor marked atrophy of her optic nerves. She has had three children. The first died at 16 weeks, having always been apparently healthy; "took cold," and was given an overdose of medicine by mistake. The second was apparently healthy, but "took cold," and died suddenly at 11 weeks. The third, always sickly and "cankered." died at 6 weeks.

Another brother, now 33, has used glasses some ten years, only for reading. He keeps a baker's shop, and his eyes do not trouble him when about his business. The oldest sister, over 50, and the brother and sister next younger than the married sister whose case is given, have no trouble with their eyes. The three that are said to have good eyes are the first, fourth, and fifth. The four that have poor eyes are the second, third, sixth, and seventh.

The parents of this afflicted family were *not* blood-relations.

The father's aunt, blind from youth, died at 60.

The father's father had inflammation in his eyes "from a cold," and was blind for three or four years before his death, at the age of 76.

ENUCLEATION OF AN EYEBALL, FOLLOWED BY IMMEDIATE AND MARKED REDUCTION OF THE AMOUNT OF URINE PASSED, IN A CASE OF DIABETES INSIPIDUS. By Dr. Geo. T. Stevens, Albany, N. Y.

On the 17th of September, 1877, Mr. S. brought to me his daughter, whose case had been referred to me by Dr. Smythe, of Minaville, N. Y.

A., the patient, was a bright and interesting girl, thirteen years of age, who had, five years previous to the visit to me, thrust the sharp point of a scissors into the right eyeball, penetrating the sclera and the ciliary body.

Intense inflammation followed the injury, but under the care of the family physician she at length recovered from the inflammation, preserving mainly the form of the globe, but with entire loss of sight of the injured eye.

There was, at the time of her visit to me, opacity of the lens, and the pupillary border of the iris was adherent to the capsule ; a prominent scar at the outer border of the cornea marked the location of the injury.

The eyeball was somewhat enlarged, and tender upon pressure, especially over the ciliary region.

It was the condition of the uninjured eye which had led the father to consult me.

This eye had for several weeks been painful and extremely sensitive to light, conditions causing much solicitude on the part of her friends. I found the eye quite sensitive to pressure, with well-marked pericorneal injection, and learned that she was annoyed by subjective sensations of light.

Ophthalmoscopic examination revealed nothing more than hyperæmia of the deep structures.

I had no hesitation in informing the father that the child was suffering from a sympathetic irritation of the eye, and that it might at any time pass to sympathetic inflammation which would be likely to prove fatal to the sight of the eye. I advised that no time be lost in removing the injured organ, as it was the only safe course.

My advice was accepted, and on the following day the girl presented herself accompanied by an elder sister, when, under the influence of anæsthetics, the injured eye was removed.

The case progressed favorably so far as the wound of the operation was concerned, and after a few days she was allowed to return home, the pain and irritability of the remaining eye having been greatly diminished, although not altogether relieved, as there remained considerable supraorbital neuralgia of the side from which the eye had been removed, and a less degree on the other. On this account she was advised to return after a few days.

It was nearly a month after the operation when the patient did return, this time accompanied by her mother; and it was at this interview that I first learned the facts which gave to the case unusual interest.

From the mother I learned that the girl had always, until the time of the injury to the eye, been a vigorous and healthy child, never having suffered from any form of nervous troubles. After the injury, however, and up to the time of the operation, she had suffered many violent paroxysms of pain in the stomach, each of which had prostrated her with severe illness for several days.

These attacks the mother called inflammation of the stomach, but from her description I regarded them as attacks of violent neuralgia of the stomach. She had also suffered greatly from headaches —so much so as seriously to interfere with her attendance at school, from which she had been detained the greater part of the time since the injury.

But the fact of greatest interest was, that during four years past she had suffered from a severe form of *diabetes insipidus*, which had run a very uniform course during all those years.

She had habitually voided the urine very frequently during the day, and it had been the custom of the mother or the elder sister to rouse her from her bed several times every night for this purpose, and it had been usual for her to fill an ordinary chamber-vessel nightly. Notwithstanding all these precautions and the great discharge into the vessel, no night passed when the bed was not repeatedly wet, the fluid sometimes penetrating the mattresses and flooding the floor beneath.

On the night after the removal of the eyeball, the sister, not wishing to disturb the patient, made the best preparations she could for the protection of the bed, and carefully watched her during the night. To her surprise, no urine was passed until the patient rose in the

morning, and, to the greater surprise of both sister and mother, there had been no involuntary discharge of urine from the time of the operation to the time of the mother's visit to me, a month afterward.

The amount of urine passed during the day was greatly reduced in quantity, and although she was still under the necessity of leaving her bed once, or even at times twice during a night, usually, yet many nights passed when she was not subjected even to this inconvenience.

For several months I watched the case with great interest, and, with the exception of a slight relapse on one or two occasions when she had been exposed to fatigue and cold in coming to Albany and returning, I was assured that there had been no return of the involuntary discharges. Not only this, but the headaches were much relieved and the pains in the stomach had entirely disappeared.

As there still remained some supraorbital pain, especially over the orbit from which the eye had been removed, and as there was still an abnormal secretion of urine, I had the patient return to Albany for a week or two, during which Faradism was practised, the current being passed from the supraorbital region to the temple. Under this treatment she was so nearly well of both troubles that I allowed her to return home.*

There the supraorbital pain and the dysuria returned in about the same degree as before the treatment with the battery. As her friends wished her to remain at home, various medicines were prescribed, with a view of arresting the pain over the brows and of checking the renal secretion, but I am not aware that any medicine had the slightest effect upon either. About two months ago—or about eight months after the removal of the eye—the frontal pain was again almost as intense as before the operation, and involuntary discharges of urine returned, although in a degree scarcely to be compared to the original condition. I now insisted upon the parents procuring a battery, and administering the induced current as before. No sooner was this done than the two troublesome conditions yielded, although neither has ever been fully and completely subdued.

* As the existence of the abnormal secretion of urine was not suspected by me at the time of the removal of the eyeball, of course no examination of the character of the fluid, nor any measurement of the amount evacuated daily, was made.

That the amount was enormous seems beyond question, from the testimony of the patient and her friends. Specimens examined after the operation exhibited a specific gravity of about 1,010, a faintly acid reaction, and absence of sugar or albumen.

The painful spot is a surface nearly an inch square, over the inner angle of the eyebrow of the right side. A corresponding point, with pain of much less intensity, is over the other eyebrow. The first is always tender to the touch, and the other generally. There is no apparent thickening of the tissues at either of these points.

There seems unquestionably to be neuritis, which is relieved by Faradism, which does not yield to any medicine yet administered.

We have in this case the phenomenon of an obstinate and dangerous disease of distant organs, having for its exciting cause an injury to the ciliary body, almost entirely relieved by the removal of the eye, but continued in a modified degree by a neuritis of some of the branches of the ophthalmic nerve acting as a secondary centre of irritation : the distant disease relenting when there is less manifestation of neuritis, and renewing its manifestations when the symptoms of neuritis are active.

Diabetes insipidus is generally recognized as a nervous disease, and if irritation from injury of the ciliary nerves is competent to produce so great disturbance of the functions of distant organs as appears in this case, it seems an entirely justifiable conclusion that irritation of these same nerves from any cause may be productive of neurotic disturbances of various forms, and without regard to distance or immediate nervous communication : and it would also seem reasonable to suppose that we may expect to relieve these neuroses, when a relation between the two classes of conditions is found to exist, by such measures as would be calculated to relieve the ciliary irritation.

During the past four years I have, at various times, endeavored to call the attention of the medical profession to relations between difficulties and derangements attending the performance of the functions of the ciliary nerves and a great variety of nervous phenomena. In so doing I have hoped to convince the profession that these relations are of far greater frequency and consequence than have been heretofore conceded.

Whether the case above related has a legitimate bearing upon the principle which I have advanced, I submit to the profession.

Certainly, my own experience in a considerable number and variety of obstinate and obscure neuroses, which, after resisting all ordinary treatment, have easily and quickly yielded to measures directed to the relief or assistance of the ciliary nerves in the performance of their functions, has led me to the belief that this case has an important bearing upon that principle.

A CURVED KNIFE FOR CERTAIN FORMS OF STRICTURE OF THE INFERIOR LACHRYMAL CANALICULUS. By Dr. C. R. Agnew, New York.

All must have encountered cases of lachrymal obstruction in which the calibre of the inferior canaliculus is greatly reduced by a stricture just where the canal should pass by a free opening into the lachrymal sac. I have long observed that the common strabismus-hook would pass such a stricture when a probe or probed knife pressed onward in the plane of the canaliculus would be stopped entirely, or, if unduly pushed, perforate the floor of the canal, and make a false passage below the stricture, and between the sac wall and the maxillary bone. The curve in the strabismus hook seemed to make it comparatively easy to override the stricture and to pass the instrument forward into the dome of the lachrymal sac. Following out this line, it occurred to me to make an instrument shaped somewhat

like a strabismus-hook, only a little more curved, and upon a smaller arc, and to sharpen the inside of the curve, and to make the extremity probe-pointed, so that, having passed it into the sac, I might incise the upper wall of the canaliculus at the sac entrance, and so make way for subsequent instrumental manipulation. The instrument here delineated may also be made to cut the lower floor of the canaliculus near the sac by first introducing it into the sac with the convex edge downward, and then sweeping it around before withdrawing it, so as to make it cut downward.

The instrument may not be new; my colleagues may think it of no value. I have only to say that I have used it with benefit to patients when other means had failed.

Note.—The bulb on the free end of the knife should not be quite so large as the cut shows.

TRANSACTIONS

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Whole number.....78

MINUTES OF THE PROCEEDINGS.

FIFTEENTH ANNUAL MEETING.

NEWPORT, *July* 24, 1879.

THE Society held its Fifteenth Annual Meeting at the Aquidneck House, at 9.30 A.M. The President, DR. HENRY D. NOYES, in the chair.

In the absence of Dr. Richard H. Derby, the Secretary, Dr. David Webster was elected Secretary *pro tem.*

The minutes of the last session of the last meeting were read and approved.

The following gentlemen were appointed by the Chair a Committee on Membership and Nomination of Officers: Drs. H. W. Williams, J. Green, G. C. Harlan, J. S. Prout, and W. H. Carmalt.

The President appointed as a Committee on Bulletin, Drs. Hasket Derby, E. Dyer, and G. Strawbridge; and as Auditing Committee, Drs. F. B. Loring and H. G. Miller.

The Report of the Treasurer was read, and referred to the Auditing Committee. Having been reported as correct, it was accepted by the Society.

The resignation of Dr. Francis Delafield was presented, and accepted.

The following gentlemen were then proposed for membership by the Committee on Membership:

DR. SAMUEL D. RISLEY, of Philadelphia, proposed by Drs. Norris and Harlan.

DR. HENRY S. SCHELL, of Philadelphia, proposed by Drs. Norris and Harlan.

Dr. Olof Page, of San Francisco, proposed by Drs. Norris and Harlan.

Dr. Leartus Connor, of Detroit, Mich., proposed by Drs. J. F. Noyes and Knapp.

Dr. S. Theobald, of Baltimore, proposed by Drs. Murdoch and Strawbridge.

Dr. Samuel B. St. John, of Hartford, proposed by Drs. Agnew and Carmalt.

Dr. J. A. Andrews, of Stapleton, S. I., proposed by Drs. Agnew and Webster.

Dr. H. W. Bradford, of Boston, proposed by Drs. H. Derby and Dennett.

The Committee on Bulletin reported, and the President called upon

1. Dr. H. Knapp, who presented to the Society: (1) "Specimens of a Tumor of the Optic Nerve, occurring in a Child of Five Years," (2) "Specimens of Choroidal Sarcoma," and (3) "Remarks on the Operation for Complicated Cataracts."

The case of "Tumor of the Optic Nerve" was discussed by Dr. T. R. Pooley.

The Chair wished to place upon record the fact that a tumor of the optic nerve was described by Dr. John A. Liddell some twenty years ago.

The operation for complicated cataract was discussed by Drs. Buller, Strawbridge, Agnew, J. Green, Harlan, and Norris.

The Society requested that Dr. Knapp's remarks be reduced to writing, and referred to the Committee on Publication.

2. "A Cosmetic Application of Glasses," by Dr. J. Green.

The Society requested that Dr. Green's remarks be reduced to writing, and referred to the Committee on Publication.

3. "The Influence, on Refraction, of Four Years of College Life," by Dr. Hasket Derby.

Dr. Derby's paper was discussed by Drs. Hutchinson, Car-

malt, Agnew, and Knapp, and was referred to the Committee on Publication.

4. "Dacryocystitis of Nursing Infants," by Dr. Kipp.

5. "A Case of Sarcoma of the Conjunctiva," by Dr. E. Dyer.

6. "Extirpation in Panophthalmitis," by Dr. G. C. Harlan.

Discussed by the Chair, Drs. H. W. Williams, Prout, and Webster.

7. "Remarks on the Use of Atropine in the Treatment of Strabismus," by Dr. J. Green.

Discussed by Drs. Dennett, Knapp, Agnew, and Strawbridge.

8. "Prolapse of Retina, from Hemorrhage following Iridectomy for Glaucoma," by Dr. D. Webster.

Discussed by the Chair, Drs. Green, Williams, and Agnew.

9. "Demonstration of Water Color Drawings of some of the Rarer Forms of Eye Disease," by Dr. W. F. Norris.

10. "The Diffusion Circles of Ametropia," by Dr. A. G. Heyl.

11. "Ischæmia of Retinal Vessels of both Eyes, following Facial Erysipelas," by Dr. D. Coggin.

12. "Paresis of the Superior Oblique Muscle," by Dr. H. D. Noyes (the Vice-President in the chair).

13. "A Case of Apparent Atrophy of the Optic Nerve, in which Recovery of Vision followed the Injection of Strychnia," by Dr. D. Webster.

14. "Remarks on Operations for Entropion," by Dr. J. Green.

15. "A Case of Trial Glasses," by Dr. J. Green.

The above papers were all referred to the Committee on Publication.

The Society then went into Executive Session.

An amendment to the By-Laws, proposed in the Session of 1875, by Dr. H. W. Williams—

"That no action in matters of discipline shall be taken at any session of an annual meeting at which there shall be present less than three-fourths of the members registered as attending such annual meeting.

A vote of three-fourths of the number thus present shall be necessary for expulsion"—

was adopted by the Society.

The proposed amendment to the By-Laws, by which the number of members of this Society was to be limited to eighty, was lost.

The Society then adjourned.

Evening Session at 7 P.M. The President, DR. NOYES, in the chair. The minutes of the last session were read, and, after amendment, were approved.

The Vice-President, Dr. Norris, took the chair, and the Society listened to a series of communications by the President, entitled:

16. (*a*) "Plastic Operations at the Inner Canthus." (*b*) "Treatment of Extensive Synechia Anterior." (*c*) "Ophthalmoscope with Cog-wheel Attachment." (*d*) "Chart of Visual Field."

Discussed by Drs. Wadsworth, Norris, and Kipp.

The following papers were then read:

17. "Notation of the Angle in Astigmatism," by Dr. J. S. Prout.

18. "Description of a Perimeter," by Dr. W. H. Carmalt.

19. "Statistics of Cataract Extractions," by Dr. H. D. Noyes.

20. (1) "Black Opacity of the Cornea." (2) "Toleration of Foreign Bodies on the Iris," by Dr. Dixon.

Dr. H. W. Williams exhibited a bit of wood seven-eighths of an inch long and three-sixteenths of an inch wide at one end, tapering to a point, which he removed from between the skin and the tarsal cartilage of the upper lid of a boy nine years of age.

It had been forced through the skin, and broken off from the end of a stick which was thrust against the eye by another boy, eight weeks previously. The eyeball was uninjured.

21. "A Case of Intraorbital Tumor of Rapid Growth," by Dr. J. F. Noyes.

The above papers were all referred to the Committee on Publication.

Dr. Robert Sattler, of Cincinnati, was proposed for membership by Drs. Agnew and Pooley.

Adjourned.

July 25th.

Morning Session at 9.30. The President, DR. H. D. NOYES, in the chair. The minutes of the last session were read, and, after amendment, approved.

22. "A Case of Foreign Body in the Posterior Pole of the Lens," by Dr. T. R. Pooley.

Discussed by the Chair, Dr. Agnew, and Dr. Webster.

By invitation, Dr. S. Theobald, of Baltimore, showed his instruments for treatment of strictures of the lachrymal passages, and read his paper upon the same.

Discussed by Drs. Kipp, Green, Dyer, J. F. Noyes, Agnew, and the Chair.

Voted, "That the thanks of the Society be conveyed to Dr. Theobald for his valuable paper, and that Dr. Theobald be requested to allow his paper to be referred to the Committee on Publication."

The Society went into Executive Session.

Upon recommendation of the Committee on Membership, Dr. Stephen Dodge, of Halifax, Nova Scotia, was elected a member of the Society.

The following officers were elected for the ensuing year:

President—DR. HENRY D. NOYES, New York.

Vice-President—DR. W. F. NORRIS, Philadelphia.

Recording Secretary and Treasurer—DR. RICHARD H. DERBY, New York.

Corresponding Secretary—DR. J. S. PROUT, Brooklyn.

Committee on Publication: DR. E. G. LORING, DR. D. B. ST. JOHN ROOSA, } New York.

The report of the Committee, recommending Newport as the place for the next annual meeting, and that Dr. H. G. Miller, of Providence, be a local committee to secure a suitable room for the meeting, was adopted.

The Society then resumed Open Session.

Dr. B. Joy Jeffries read a paper on (*a*) "Color-Blindness and Tests." (*b*) "Visual Standards," and offered demonstrations of colored worsteds.

It was moved by Dr. John Green:

"That a medical stenographer be employed to report the discussions at the next meeting of the Society, the stenographer's manuscript to be submitted to the Committee on Publication, with authority to condense and edit the same for publication in the Transactions."

This resolution was seconded and carried.

It was moved by Dr. J. S. Prout:

"That the Secretary, about June 1st, send a request to each member to forward the titles of such papers as he desires to present at the next meeting of the Society, and that such titles be incorporated by the Secretary in the printed call for the meeting, such papers to have precedence over all others."

This motion was also seconded and carried.

On motion of Dr. J. S. Prout:

Resolved, That the American Ophthalmological Society recommend the adoption of Javal's notation in prescribing cylindrical and prismatic glasses, viz., that the zero point be taken at the *left* of the horizontal meridian (in the position of the glass as when the patient looks through it), and that the degrees of inclination of the axis of the cylindric glass, and the position of the base of the prism, be expressed in degrees counting upward around the circle from this zero to 360°.

Moved by Dr. E. Dyer, and seconded by Dr. J. Green:

"That no paper be allowed to go on the Bulletin, unless the paper be in manuscript, or the author verbally communicates the subject-matter of his paper to the Society, and that, in the case of papers read only by title, the Committee on Publication shall have power to accept or to reject them at their discretion."

Carried.

Dr. J. Green offered a resolution to the effect that Dr. B. J. Jeffries be requested to make such arrangement as he may find to be practicable, to enable the members of the Society and others to procure suitable collections of colored worsteds for testing for color-blindness.

This resolution was adopted.

The minutes of the present session were read and approved, after which, on motion, the Society adjourned to meet at Newport on the fourth Thursday of July, 1880.

RICHARD H. DERBY,

Secretary.

The following members were present at the meeting of July, 1879:

DR. C. R. AGNEW.....New York.
DR. F. BULLER.....Montreal.
DR. W. H. CARMALT.....New Haven, Conn.
DR. DAVID COGGIN.....Salem, Mass.
DR. W. S. DENNETT.....Boston, Mass.
DR. HASKET DERBY.....Boston, Mass.
DR. JOHN H. DIX.....Boston, Mass.
DR. LEWIS S. DIXON.....Worcester, Mass.
DR. E. DYER.....Pittsburgh, Pa.
DR. JOHN GREEN.....St. Louis, Mo.
DR. G. C. HARLAN.....Philadelphia, Pa.
DR. A. G. HEYL.....Philadelphia, Pa.
DR. EDWIN HUTCHINSON.....Utica, N. Y.
DR. B. JOY JEFFRIES.....Boston, Mass.
DR. CHARLES J. KIPP.....Newark, N. J.
DR. H. KNAPP.....New York, N. Y.
DR. F. B. LORING.....Washington, D. C.
DR. S. F. MCFARLAND.....Oxford, N. Y.
DR. C. S. MERRILL.....Albany, N. Y.
DR. H. G. MILLER.....Providence, R. I.
DR. W. F. NORRIS.....Philadelphia, Pa.
DR. H. D. NOYES.....New York, N. Y.

Dr. J. F. Noyes.....Detroit, Mich.
Dr. O. D. Pomeroy.....New York, N. Y.
Dr. T. R. Pooley.....New York, N. Y.
Dr. J. S. Prout.....Brooklyn, N. Y.
Dr. G. T. Stevens.....Albany, N. Y.
Dr. George Strawbridge.....Philadelphia, Pa.
Dr. J. J. B. Vermyne.....New Bedford, Mass.
Dr. O. F. Wadsworth.....Boston, Mass.
Dr. David Webster.....New York, N. Y.
Dr. H. W. Williams.....Boston, Mass.

ON THE OPERATION OF SOME KINDS OF COMPLICATED CATARACT. By Dr. H. Knapp, of New York.

Among the complicated cataracts there are two kinds on which I beg to make some remarks concerning their removal: I mean the hypermature cataract with thickened capsule, and the cataracts complicated with fluidity of the vitreous.

As to the former, I previously used to operate for them by extraction according to the regular peripheric linear, *i. e.*, Von Graefe's method, circumcising the patch of thickened capsule with a sickle-shaped needle as well as I could, and afterward extracting the central thickened piece with the cystotome or iris-forceps, either before or after the expulsion of the lens. The results of this procedure were commonly good: they did not, at least, essentially differ from those obtained in the ordinary forms of senile cataract. Yet, when I gave up the excision of a central piece of the anterior capsule, as a general method, replacing it by the peripheric division of the capsule, the central thickening of the anterior capsule seemed to be particularly unfavorable for the peripheric opening. In *the first place*, it would seem as though hard cataracts, the cortex of which was partially converted into a kind of connective tissue and intimately united to the capsule, could not find an easy exit through a peripheric opening. This apprehension was not verified by experience. In all cases of hypermature cataract with thickened capsule, the lens slipped out with the greatest ease through a peripheric opening, provided the opening was large enough. I may here repeat what I have stated elsewhere, that in large, perfectly mature or hypermature hard cataracts, a larger section of the capsule is required than in soft cataracts, or cataracts with a soft cortical substance. The insufficient opening of the capsule will render the expulsion of the hard and large lens difficult and dangerous, acting prejudicially in the same manner as does an insufficient corneal section. A T-shaped opening, with a long horizontal line along the corneal section, and a small vertical one in the centre of the coloboma—which, as far as my experience goes, offers the most favorable conditions for the exit of the lens—seems to enjoy only a limited utility in hypermature cataract with a thickened

capsule, since the compact lens, on its way out, cannot enlarge the vertical line of the opening as far as its thickness would require, but only as far as the margin of the thickened part of the capsule. If, then, the capsular opening be insufficient, considerable outward pressure has to be employed in order to make the cataract enlarge the horizontal incision. This, of course, will only be the case when also the peripheric part of the capsule is tough and resistent, a condition of the occurrence of which I have repeatedly satisfied myself by experience. The modes in which the outgoing lens may dilate an insufficient horizontal incision are described in a paper of mine in the just published number of the Archives of Ophthalmology.[1]

I am, therefore, particularly careful to make a large horizontal incision into the capsule in all cases of hard cataract, and in doing so I have never found that the central thickening of the capsule, even when it was very extensive, offered any obstacle to the easy exit of the lens.

In *the second place*, the thickened capsule, if left in the eye, seems to preclude the recovery of good vision, and from this reason almost all operators have made it a rule to extract it either before or after the exit of the lens. From what I have seen during the last two years, I can state that the thickened capsule, when left in the eye, is by no means an insurmountable obstacle in the way of recovering good vision. It can even be easily dealt with. If it fills a part of the pupil, even a small part only, it should be put out of the way, since the part of the pupil which it obstructs is optically the most important. In such cases I have always made a horizontal incision into the capsule along the upper border of the thickened part, then a vertical one above the horizontal and joining the latter in the centre, and lastly couched the thickened portion behind the iris. This procedure has, thus far, invariably given me good results. On the mode of the secondary division of the capsule, the instruments best adapted for that purpose, the time when it should be done, etc., I have spoken of at length in the just quoted paper, under the head of After-operations.

The *second kind* of cataracts on which I beg to make some remarks are cataracts complicated with marked fluidity of the vitreous. I do not mean the partial or limited fluidity of the vitreous which we frequently find—for instance, in many cases of near-sighted eyes, and which require no particular precaution—but I mean those cataracts

[1] Report on a Sixth Hundred of Cataract Extractions. Vol. viii., p. 220.

where the previous examination with the ophthalmoscope and the functional examination have demonstrated deeper changes in the interior of the eye. The corneal section, in such cases, should be less peripheric than usual. The course and issue of the corneal section are the practical test of these cases, furnishing the indications for the further steps of the operation. If no vitreous has escaped during the corneal section, and the cataract is not considerably dislocated downward, it will be well to proceed with the operation in the usual manner. But when, during the corneal section, fluid vitreous oozes out, an iridectomy will only favor the escape, and neither the ocular tension nor external pressure will have a great influence on the expulsion of the cataract, but tend to increase the outflow of the vitreous, necessitating some kind of "accouchement forcé" with all its disastrous consequences. Now, I think that in such cases *an iridectomy does more harm than good, and ought not to be made.* When, during the corneal section, fluid vitreous escapes, showing that the suspensory ligament is defective or torn, I imagine that the iris, left in position, will to a certain degree supply the protection which the vitreous receives from the zonula Zinnii. Acting on this principle, I have recently removed two such complicated cataracts without iridectomy, and the results were so unexpectedly good as to encourage me to give the procedure a more extensive trial. In one of these cases, with M. $\frac{1}{3}$ in the other eye, with a high degree of rarefaction of the whole choroid, such an abundant quantity of watery vitreous flowed out during the section and at every muscular effort of the patient as well as at every touch on the eye, that I almost despaired of being able to remove the cataract at all. I made no iridectomy, but divided the capsule as freely as was possible under the circumstances. The iris receded, the anterior chamber was deep, and the lens did not yield to the usual manœuvre of pressing on the cornea with a spoon; on the contrary, it seemed to sink more deeply into the eye, and more vitreous escaped. Then I removed the lid-speculum, gave the eye rest for some minutes, and tried to expel the lens by methodical pressure with my fingers and the patient's eyelids. With my left index I pressed the upper lip of the wound back toward the centre of the eye, and with my right index I pressed the edge of the lower lid upon the inferior part of the cornea, the pressure likewise directed toward the centre of the eye. This made the wound gape and the lens present, upon which I pushed the edge of the lower lid, while continuing the pressure, upward toward the corneal section, and had the pleasure of seeing the cataract escape

without further loss of vitreous. The recovery was undisturbed, and the patient discharged three weeks after the operation, with a central pupil and good sight. The other case was operated on in the same way; the lens, however, was only partially removed, since it split into segments. The remainder, about one-third of the whole lens, was gradually absorbed, leaving a clear central pupil and very good sight.

INFLUENCE, ON THE REFRACTION, OF FOUR YEARS OF COLLEGE LIFE. By Hasket Derby, M.D.

Most of the published statistics of refraction have been gained by examinations of all the pupils attending the school, gymnasium, or college, where the examination was conducted, at one given time. It is somewhat remarkable that so little has been done toward carrying out the suggestion of Donders that repeated examinations of the same individuals should be made at different periods of their educational career. Could this be done on an extensive scale, it is clear that valuable and comparatively accurate information might be gained on several very interesting points, especially with reference to the age at which and the individuals in whom myopia is most apt to be progressive; the circumstances under which this disease is developed from emmetropia of considerable duration; the rate of its progress at different ages, and the result of measures taken to arrest its advance. It is evident that statistics thus gathered would be more accurate, as well as more reliable, than those obtained by a single inspection of the classes of different years.

With a view of making a small contribution to such researches, I visited Amherst College in 1875, and examined the class entering that year, intending to follow at least four successive classes through their college course. Each year, up to and including the present, a fresh class has been examined at its entrance, and the results carefully recorded. The class of 1879 has now completed its full term of four years, and the eyes of its members have undergone their final examination. Intending, as I do, to make an extended report three years hence, it has still seemed right to communicate to the Society even the scanty figures as yet brought together, in the hope not only that others may be induced to pursue similar investigations, but that

the method I have employed may possibly be criticised, or suggestions made that will give a greater value to the results to be obtained from the three remaining classes.

Though the classes themselves were comparatively small, and the age at which the men entered college precluded the probability of any excessive or startling change of refraction, it was felt that the results of this course of examinations, whether positive or negative, would yet furnish some valuable information on the points already alluded to.

The commonly accepted statement, moreover, that the greatest and most important changes in refraction are apt to take place between the fifth and twentieth year, is fully supported by facts, as far as they go. But most investigations have stopped at this age. The changes that may take place after twenty, and the rate at which they go on during the subsequent years of educational life, have never, as yet, been made to any extent the subject of accurate inquiry. Here was an opportunity for work in this direction.

Every facility for the prosecution of these investigations was afforded me by the authorities of Amherst College, through Dr. Hitchcock, the Professor of Hygiene. One indispensable requisite was that the whole class should be examined, and in accordance with this the attendance of each student was made obligatory.[1] With rare exceptions every individual of each class was present. They were admitted to the examination room singly, in order that no familiarity with the process might be acquired in advance. Snellen's letters were used, six metres away, lit up by two strong kerosene burners, which were placed behind a screen. Uniform illumination was thus attained at every examination. A separate record was made for each eye. It is only since 1876 that metric glasses have been used, but for the sake of uniformity all the results are stated in metric terms. To avoid error, in stating slight changes of refraction, the old glasses were used at the final examination of the present class, and the metric reduction effected afterward.

It will be seen that I have included very slight degrees of ametropia, although some investigators have not reckoned in a myopia of less than one dioptric ($-\frac{1}{36}$). I fail to see the justice of this ar-

[1] I had hoped to have carried out a series of similar examinations among the undergraduates of Harvard, but failed of sufficient support from the Faculty, who declined to require the attendance of students, although doing all in their power to encourage the presence of volunteers. Under these circumstances only half the class attended. No reliable statistics could therefore be obtained.

bitrary limitation. If vision, previously less than normal, is made perfect by the use of —0.5 D, there is no valid reason why that amount of myopia should not be recorded. I have therefore followed the example of Emmert [1] in so doing, and have stopped there, as this corresponds to the weakest glass of the old trial case.

The results I obtained with the class of 1879 may be briefly stated in tabular form. At its entrance the number of members was 83, who were examined for the first time Nov. 16, 1875. 61 of those previously examined presented themselves again June 2, 1879. These alone are included in Table I.

The average age at entrance was 21.

TABLE I.—Refraction of Class of 1879.

November, 1875.			June, 1879.	
Cases.		Percentage.	Cases.	Percentage.
Emmetropia	31	50.8	22	36.0
Hypermetropia	3	5 0	8	13.2
Myopia	27	44.2	31	50.8

That a better idea may be obtained of the average refraction found among the students who enter this college, I give a second table, made up of all the cases I have examined at entrance, 321 in all, and comparing their percentage with that of this class.

TABLE II.

Whole class of 1879 at entrance.	Four classes at entrance.
Percentage.	Percentage.
Emmetropia 49.4	45.2
Hypermetropia 6.0	20.9
Myopia 44.6	35.9

[1] Refractions- und Accommodations-Verhältnisse des menschlichen Auges, von Dr. E. Emmert. Bern. 1877.

The myopia of this class is thus shown to be in excess, and the hypermetropia considerably less than was found with the other classes. The above figures do not bear out Emmert's theory [1] that hypermetropia is the most frequent condition of refraction among all people, and at every age.

Analyzing now the myopia found at entrance and at graduation, we find the following figures :

TABLE III.

1875.		1879.
Percentage of Myopia less than 1 D....	23	25.8
Percentage of Myopia equal to, or exceeding 1 D.....	21	24.2
	44	50

and, finally,

TABLE IV.

	CASES.		PERCENTAGE OF WHOLE CLASS.
During College Course of four years.	Myopia developed from previous Emmetropia in.....	7	10.6
	Increased its amount, in.....	14	21.2
	Remained unchanged in	11	16.6

I have appended two tables of individual cases. The first shows the amount of change from emmetropia to myopia. The other sets forth, in the same way, the amount of increase of existing myopia in each case, accompanied, whenever possible, by remarks on the character and habits of the individual.

[1] L. c., p. 45.

TABLE V.—Changes from Emmetropia to Myopia in Dioptrics.

Initials.	Age at Entrance.	Original Examination and Date.	Final Examination and Date.	Remarks.
		Nov. 16, 1875.	June 2, 1879.	
G. R. B.	17	O. D. Em.	O. D. Em.	
		O. S. Em.	O. S. My. 0.5 D.	
		Nov. 16, 1875.	June 2, 1879.	
C. R. B.	21	O. D. Em.	O. D. My. 0.5 D.	
		O. S. My. 0.5 D.	O. S. My. 0.5 D.	
		Nov. 16, 1875.	June 2, 1879.	
E. P. C.	18	O. D. Em.	O. D. My. 1 D.	
		O. S. Em.	O. S. My. 1 D.	
		Nov. 16, 1875.	June 2, 1879.	
D. A. N.	20	O. D. Em.	O. D. My. 0.75 D.	Average student.
		O. S. My. 0.75 D.	O. S. My. 1.25 D.	
		Nov. 16, 1875.	June 2, 1879.	
O. J. S.	17	O. D. My. 0.5 D.	O. D. My. 0.5 D.	
		O. S. Em.	O. S. My. 0.5 D.	
		Nov. 16, 1875.	June 2, 1879.	
A. W. S.	16	O. D. Em.	O. D. My. 1.25 D.	Small staph. post. has developed in each eye since first examination.
		O. S. Em.	O. S. My. 1 D.	A very hard student, has worked injudiciously.
		Oct. 25, 1876.	June 2, 1879.	
F. D. K.	20	O. D. Em.	O. D. My. 0.75 D.	Examined first in Nov., 1875. Then apparent My. 0.5 D. in each eye, due to spasm of accommodation. The next year Em. in each eye.
		O. S. Em.	O. S. My. 0.75 D.	At last examination the ophthalmoscope showed true Myopia.

TABLE VI.—Increase of Existing Myopia.

Initials.	Age at Entrance.	Original Examination and Date.	Final Examination and Date.	Remarks.
G. M. A.	20	Nov. 16, 1875. O. D. My. 1 D. O. S. My. 1 D.	June 2, 1879. My. 1.5 D. My. 1.5 D.	
W. C. B.	17	Nov. 16, 1875. O. D. My. 0.5 D. O. S. My. 0.75 D.	June 2, 1879. O. D. My. 0.5 D. O. S. My. 2 D.	
A. S. C.	22	Nov. 16, 1875. O. D. My. 0.75 D. O. S. My. 0.75 D.	June 2, 1879. O. D. My. 1.5 D. O. S. My. 1.5 D.	A very hard worker.
C. B. G.	18	Nov. 16, 1875. O. D. My. 0.5 D. O. S. My. 0.5 D.	June 2, 1879. O. D. My. 0.75 D. O. S. My. 0.75 D.	Good student.
G. F. J.	16	Nov. 16, 1875. O. D. My. 1 D. O. S. My. 1.5 D.	June 2, 1879. O. D. My. 1.5 D. O. D. My. 1.5 D.	First scholar in class.
D. A. N.	20	Nov. 16, 1875. O. D. Em. O. S. My. 0.75 D.	June 2, 1879. O. D. My. 0.75 D. O. S. My. 1.25 D.	Average student.
L. E. P.	21	Nov. 16, 1875. O. D. My. 1.5 D. O. S. My. 2.5 D.	June 2, 1879. O. D. My. 3 D. O. S. My. 3.5 D.	A very assiduous reader.

TABLE VI.—Increase of Existing Myopia—*Continued.*

INITIALS.	AGE AT ENTRANCE.	ORIGINAL EXAMINATION AND DATE.	FINAL EXAMINATION AND DATE.	REMARKS.
W. A. S.	17	Nov. 16, 1875. O. D. 1.25 D. O. S. 1.5 D.	June 2, 1879. O. D. My. 1.75 D. O. S. My. 2.25 D.	Hard worker.
S. H. S.	20	Nov. 16, 1875. O. D. My. 6.5 D. O. S. My. 6 D.	June 2, 1879. O. D. My. 7 D. O. S. My. 8 D.	
H. H. S.	19	Nov. 16, 1875. O. D. Em. O. S. My. 0.5 D.	June 2, 1879. O. D. Em. O. S. 1 D.	
A. D. S.	24	Nov. 16, 1875. O. D. My. 1 D. O. S. My. 1.5 D.	June 2, 1879. O. D. My. 1.5 D. O. S. My. 1.75 D.	
G. A. W.	15	Nov. 16, 1875. O. D. My. 1 D. O. S. My. 1.75 D.	June 2, 1879. O. D. My. 1.25 D. O. S. My. 4 D.	Very indolent, except with his microscope. For this he uses the right eye.
N. M.	21	Oct. 24, 1876. O. D. My. 0.5 D. O. S. My. 0.5 D.	June 2, 1879. O. D. My. 1 D. O. S. My. 1 D.	Hard worker, studies much before breakfast.
F. R. H.	20	Oct. 24, 1876. O. D. My. 0.5 D. O. S. My. 0.5 D.	June 2, 1879. O. D. 0.75 D. O. S. 0.75 D.	

DACRYOCYSTITIS IN NURSING INFANTS. By Charles J. Kipp, M.D., Newark, N. J.

With regard to the frequency of this disease in early life, Schirmer, in his monograph on Diseases of the Lachrymal Apparatus, in Graefe and Saemisch's *Handbuch der Augenheilkunde*, says: "It is certain that children are less often afflicted with dacryocystitis, and infants at the breast have till now been considered exempt from this disease. Critchett is the only one who has repeatedly seen this affection in the new-born. Helling and Caron have each observed one case. I, myself, have seen dacryocystitis of the right side combined with blepharitis in a child seven months old."

Judging from my own experience, this disease is by no means infrequent among infants here. An examination of my records shows that, of the total number of cases of eye disease registered during the last two years, 3.6 per cent. suffered from diseases of the lachrymal sac. Of these, ten per cent. were under one year of age. In most of the infants the disease was first observed shortly after birth; in several phlegmon of the sac was present. In all of them the secretion was purulent and very abundant. In twenty-five per cent. of the cases of lachrymal blennorrhœa the patients were under ten years of age.

So far as I have been able to observe, this disease is in infants almost always associated with nasal catarrh. In several of the cases carious bone was discovered by the probe at the first examination. *In none of the cases which I had an opportunity to probe, could a stricture be felt.*

The plan of treatment which has been most successful in my hands is as follows. Unless the sac can be easily emptied by slight pressure, the lower canaliculus is split. After that the nurse is instructed to evacuate the sac as often as every hour, and to remove the secretion from the conjunctival sac. If there is much swelling of, and secretion from, the Schneiderian membrane, I remove the secretion covering it by means of absorbent cotton, wrapped around a dentist's cotton-holder, and then apply a one or two per cent. solution of nitrate of silver to the swollen membrane by means of a large camel's-hair pencil once a day. I never use injections into the nose

in infants, having seen more than one case in which, even in careful hands, they were followed by purulent inflammation of the middle ear. If the disease does not get well, under this simple treatment, in the course of three or four weeks, I use Bowman's probes, and injections of astringents in the same manner as in adults.

CASE OF SARCOMA OF THE CONJUNCTIVA. With Woodcuts. Reported by E. Dyer, M.D., Pittsburg, Pa.

Ella P., æt. 6, a remarkably bright and healthy child, was brought to me November 11, 1878, presenting the following condition of the left eye: Marked exophthalmus; eyeball turned inward 45°, with very little power of movement. No intolerance of light. Reads Sn. X at 1′. No pain. The lids externally healthy, but I could not evert them, nor can she close them; they being 15 mm. apart in the median line. This condition is caused by a large tumor of the conjunctiva, which commences a little to the inside of the median line of the cornea, both above and below, and involves the whole conjunctiva of the ball to the outer canthus, presenting the appearance of chemosis, except that it does not rise so abruptly from the margin of the cornea and is more brilliantly red. The surface is covered by very fine granulations. The conjunctiva near the inner canthus is clear and healthy. Only a small spot of it can be seen, however, as the eye is turned so much inward. The child had been under observation before, and Dr. Lippincott, who first saw the patient, kindly sends me the following notes:

"I saw the case July 3, 1878; at that time the growth was about the size of a nickel three-cent piece (17 mm.), and presented somewhat the appearance of a mucous polyp. It was of a pinkish color, soft, slightly lobulated, and flattened between the lids and the globe. It was attached, at the outer canthus, to the palpebral and ocular conjunctiva by a pedicle about one-fifth of an inch in diameter. The eyeball was not limited in its movements by the growth, which, when the patient looked outward, covered the cornea to the extent of a line, and when she looked inward, was half an inch from the corneal margin. Three or four moderately large veins run from the tumor to the eyeball, but, apart from that, there was no noteworthy vascularity. The child did not complain of any pain or uneasiness. The parents stated that they noticed the trouble about three months before."

The parents then took the child to a man who, on July 8th, removed the growth "with complete success." It soon began to reappear, and on the 7th of October he removed a "large tumor from the lower eyelid, which looked like fat." As near as I could make out, from the parents' statement, it was the size of an almond; but they insisted that the entire growth was removed, and there was neither exophthalmus nor was the motion of the eye impaired. The

mass, therefore, which was presented to me, was evidently the growth of one month. I advised enucleation of the entire contents of the orbit, but was not allowed to do it until the 16th of November, nearly a week after my first examination. The tumor, in the meantime, had increased very perceptibly in size. I divided the external canthus to its fullest extent and removed the bulb, and, as well as I could see, everything but healthy tissue. The cavity was then very thoroughly cauterized with solid nitrate of silver. Much less hemorrhage than expected. Cold water dressings.

The mass removed (which was not attached to the bulb) was as large as an English walnut, and proved, under the microscope, to be sarcoma (spindled celled). The child was up and cheerful the next day, and there was every prospect of speedy recovery. On the sixth day, however, I noticed that the lids began to be bulged out, and on the seventh I was satisfied that the growth had commenced again, and that the conjunctiva of the lids was involved. The tumor grew rapidly, and soon a swelling was noticed 2.50 cm. in front of the angle of the jaw, soft, movable, and not painful. On consultation

it was determined to remove the tumors with the entire eyelids and fill the orbit with chloride of zinc paste. The parents *positively* refused to allow any further operative interference, and we were obliged to abandon the little sufferer to her fate.

I do not care to dwell on the subsequent history of the case, there was no treatment except opiates. Both tumors grew rapidly, especially the one in front of the ear. On January 22, 1879, the integument gave way, and there was a loss of eight ounces of blood; as estimated from the cutaneous vessels. Soon the skin of the upper

Dr. Dyer's case of sarcoma of conjunctiva.

Dr. Dyer's case of sarcoma of conjunctiva.

lid burst, followed by alarming hemorrhage. As the tumors grew in size, the fissures in the skin were wider opened, and, as the vessels were ruptured, fresh hemorrhages occurred. As I lived at a distance from the patient, I never saw one of them, but Dr. McKelvy, who was near at hand, tells me that there were twelve or more ; that they were very sudden and copious, eight to ten ounces, but that they were venous and had generally ceased by the time he arrived, and were evidently cutaneous. The accompanying photographs show the size of the tumors March 25th. They grew rapidly, and the

child died May 5th. She had dwindled to a mere skeleton, as will be seen from a cast taken after death.

The tumor of the neck measures 56 cm. in its greatest circumference. That of the orbit 33 cm.

An autopsy was refused, but external examination gave no evidence of disease of the internal organs. My own examination of parts of the tumors is confirmed by Dr. Gallaher, who writes me: "They contain numerous spindle-shaped cells with partial fibrillation, and there is no doubt that the new growth is what is called 'recurrent fibroid,' or spindle-celled sarcoma. The fibrillation is very marked."

EXTIRPATION IN PANOPHTHALMITIS. By G. C. Harlan, M.D., Philadelphia, Pa.

My object in introducing this subject is to elicit the opinion of the Society as to the propriety of the operation, and to learn what may be the general practice in regard to it. As is well known, v. Graefe advised against extirpating an eye in a state of panophthalmitis, on the ground that the danger of consequent meningitis was so great as to render the operation entirely unjustifiable.

The occurrence of descending optic neuritis has been established, and the disease has been traced, in post-mortem examination, along the nerve, from the brain to the eye; but I have been unable to find any positive proof of such a thing as an ascending neuritis extending from the eye to the brain, though cases are recorded that make it probable. Cases have been reported of meningitis following enucleation in panophthalmitis, ending, in some instances, in recovery,[1] and in others in death. At least six of the latter are recorded,[2] and it was upon these that v. Graefe based his advice. I have endeavored to analyze these cases, but could find detailed accounts of only three of them. Pagenstecher, who reported one of the fatal cases, made a careful examination of the optic nerves, and found them normal. He thinks the meningitis was set up by the purulent choroiditis, and not by the operation. For fourteen days before the operation there had been sleeplessness, loss of appetite, and intense headache, and sympathetic ophthalmia had existed for five days. The patient was much relieved at first, but had a violent chill twenty-four hours after the operation, and seventy-four hours after the operation died of meningitis. In another of the cases, by Just, the symptoms of meningitis did not appear until eight days after the operation; no post-mortem. In still another case, Horner found meningitis which could not in any way be traced to the enucleated eye.[3]

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[1] Royal London Ophthalmic Hospital Reports, Dec., 1877, p. 252.

[2] Annales d'Oculist, Nov., 1873, p. 253, and Jan., 1875, p. 15; Klinische Monatsblätter für Augenheilkünde, 1872.

[3] Schussverletzungen des Auges: H. Cohn, p. 12.

Six cases is a very small proportion of the enormous number of enucleations performed in the last twenty or thirty years, in many of which it may be taken for granted that the eyes were in a state of panophthalmitis, and, unless we suppose that there has been a fatal result in many unreported cases, the accidents have been scarcely numerous enough to establish a rule of practice. Cohn reports three cases[1] in which he performed enucleation during the acute stage of purulent panophthalmitis without unpleasant results, and seems inclined to throw the weight of his authority against the caution of v. Graefe. Arlt says: "Should, however, panophthalmitis be already established, the operation of enucleation cannot be considered free from danger."

I have, in a number of instances, in the past year or two, extirpated balls in a state of acute general inflammation, and have sometimes had occasion to regret not having taken the risk. Two cases which were under treatment at the same time, at the Wills' Hospital, may serve as illustrations. One, that of a man whose eye had been injured three weeks before by a piece of steel, which was supposed to be still in the ball. He suffered agonizing pain, which was only partially relieved by large doses of morphia, and was unable to leave his bed. The ball was enucleated and found not to contain a foreign body, but there were abscess of the vitreous, iridochoroiditis, and beautifully marked neuritis. All symptoms ceased at once, and the patient was restored to his work in a few days. In the other case, suppurative panophthalmitis was excited by a rather desperate attempt to let a little light into a disorganized and staphylomatous but quiet eye by iridectomy. The front of the ball was abscised, but for several days there were great chemosis, enormous swelling and tension of the lids, considerable hemorrhage from the choroid, and pain almost as severe as before the operation, and a suppurating cavity remained which required treatment for several weeks. This is, I believe, not a very unusual experience after abscission, and is worth considering in weighing the comparative risks and advantages of enucleation.

While it is a significant fact that the reported deaths after enucleation have all occurred in cases of suppurative panophthalmitis, it is to be remembered that these are just the cases in which, supposing the disease of the brain to originate in the eye, it is most possible to conceive that meningitis might have been excited without the opera-

[1] Schussverletzungen des Auges: H. Cohn, p. 12.

tion. Any case of death that may occur under these circumstances should be carefully reported, and an earnest effort should be made to establish or disprove the connection between the operation and the meningitis.

Enucleation gives the patient so much more certain and imme diate relief from present suffering and future inconvenience and danger than any partial operation, that it is a matter of great importance to decide whether v. Graefe was right in forbidding its performance in panophthalmitis.

PROLAPSE OF RETINA, IN CONSEQUENCE OF HEMORRHAGE, FOLLOWING IRIDECTOMY FOR GLAUCOMA. By David Webster, M.D., of New York.

Profuse hemorrhage from the choroidal blood-vessels, following the operation of iridectomy or of cataract extraction, is, fortunately, of very rare occurrence, as it is always necessarily fatal to vision, and usually, if not invariably, results in more or less atrophy of the eyeball. I have seen only one or two cases of the kind besides the one here reported, and I have heard of one or two others, but, so far as I can learn, in no other case has a portion of the retina been carried out through the wound by the gush of blood. More or less vitreous humor is, of course, always expelled by and with the blood in these cases.

Dr. John H., æt. 35, consulted Dr. C. R. Agnew, Dec. 30, 1878. He had divergent strabismus of his left eye, the sequel of small-pox in childhood. Two years previously the left external rectus had been divided, with partial correction of the deformity. As long as he can remember he has had only perception of large objects with that eye, being able to distinguish a man from a woman, but never much more.

Since the section of the external rectus he has had several attacks of congestion in the amblyopic eye, but an attack would last only a few days. During these attacks the vision was worse than usual, the pupil was dilated, and there was severe supra-orbital neuralgia confined to that side. The present attack came on twelve days ago. The circumorbital pain has been less severe than on former occasions, but there has been no cessation. There is circumcorneal in-

jection, and haziness of the cornea. The pupil is slightly dilated and sluggish; the tension increased. For the last five days the vision has been reduced to perception of light. A drop of a four-grain solution of sulphate of atropia was applied to the eye, and the patient asked to come again the next day.

Dec. 31.—The eye has felt easier since atropine was dropped in. The pupil is widely dilated, but the vision is no better. The emergent ciliary veins are enlarged and tortuous. The tension is still increased. For the last few days he has observed halos about lights. Right eye, vision $\frac{20}{20}$; Hm. $\frac{1}{15}$. Left eye, sees large objects moving about, but cannot count fingers. The patient says the sensation of light is like that of a deep twilight in that eye. Examined with the ophthalmoscope, the right eye shows no deviation from the normal, except the error of refraction. Of the left eye, the cornea has a kind of milk-and-water look, and, by oblique illumination, it appears as though its anterior surface had been teased, or picked up, showing an infinite number of little opaque spots on the surface. The fundus can be faintly seen by the direct method, through $+\frac{1}{10}$, and the whole disk can be seen to be capped, but the depth of the excavation cannot be measured.

The patient was kept at the office three hours, during which a one per cent. solution of sulphate of eserine was dropped into the eye twice. This contracted the pupil, but did not lessen the tension, or produce any appreciable improvement in the eye, either subjective or objective. It was therefore thought best to do an iridectomy upon the eye with as little delay as possible.

At 2.15 P. M. the patient was anæsthetized by means of chloroform, which he administered to himself until unconscious, and a broad, peripheral, clean iridectomy upward was performed by Dr. Agnew, assisted by myself.

There was no bleeding into the pupil, or other complication. No drops were put into the eye, and both eyes were dressed with absorbent cotton, a flannel bandage, and a mask of black silk.

At 9.30 P. M. I called on the patient again, and was surprised to find him in severe pain, and the dressings saturated with blood. He stated that about one hour after we left him violent vomiting set in, which he believed to be due to the chloroform. During one of his violent and prolonged expulsive efforts he distinctly "felt something give way" in his eye, and at the same time the eye became the seat of the most excruciating pain. The bleeding was observed soon after, the blood having made its appearance through the dressings.

I thought that the removal of the dressings might encourage the bleeding. I therefore allowed them to remain, and gave, hypodermically, mag. sol. morph. min. x., to relieve the pain.

January 1, 1879.—The morphia relieved the pain, and the doctor rested well. Removed the dressings, washed the eye open, and found the anterior chamber filled with blood, and a large blood-clot protruding from the widely-gaping wound. Bandaged this eye and left the other open and protected by a shade.

January 2.—The doctor rested well last night under chloral hydrate and codeine. Dr. Agnew thinks the mass protruding from the wound consists of blood, vitreous, and prolapsed retina.

January 7.—The eye got along with comparative ease until early this morning, when pain set in, which has continued moderately all day. There is considerable redness of the ciliary region. Ordered iced cloths and atropine.

January 9.—Dr. H. went to see a patient last night, for the first time since the operation. The eye has been more painful since. Injected, hypodermically, mag. sol. morph. min. x.

January 11.—Patient slept well last night without anodyne. The redness is less, but the membranous mass protruding from the wound and hanging down over the cornea gives rise to a good deal of irritation.

January 14.—While the eye was held open by an assistant I carefully snipped off with scissors, close to the wound, the light colored membranous mass, which seemed to be attached to some part of the interior of the eye, and which showed no signs of disappearing by natural processes.

January 16.—The eyeball is decidedly less red, and the doctor has experienced great relief from the absence of the substance which was excised two days ago. This substance has been examined by Drs. H. Moeller and E. L. Macwithey, of New York, both skilled in the use of the microscope, and has been found to consist of *retina*, the layer of rods and cones being easily recognized.

January 21.—The patient is able to come to the office. The eye is much improved; the lens is in its place, and behind it is an irregular, opaque mass, probably the remaining portion of the detached retina, with a changed vitreous humor. The doctor was permitted to commence work gradually, using spectacles $+\frac{1}{18}$.

February 15.—Eye still a little red, moderately shrunken, and with diminished tension.

August 2.—Upon opening the eyelids widely, atrophy of the globe

is quite evident, but, to a casual observer, there would scarcely seem to be anything amiss with the eye.

The history of this case shows, beyond reasonable doubt, that the bursting of the choroidal blood-vessels was directly due to the vomiting produced by the chloroform. Indirectly, the hemorrhage was, of course, favored by the large amount of pressure removed from the walls of the blood-vessels of the interior of the eye by the diminished intraocular pressure resulting from the removal from the eye of the aqueous humor, and a portion of the iris. I have no doubt that vomiting from ether would have produced the same effect had it been equally violent, and I think it wonderful that the same accident does not occur more frequently, when I consider how often we have violent vomiting following operations by which a considerable amount of external pressure is removed from the walls of the choroidal and retinal blood-vessels.

DEMONSTRATION OF WATER-COLOR DRAWINGS OF SOME OF THE RARER FORMS OF DISEASES OF THE EYE.

By Wm. F. Norris, M.D. Philadelphia, Pa.

There were exhibited :

I. Vascular New Growth in the Vitreous.

II. Recurrent Papilloma of the Corneo-Scleral Junction.

III. Sarcoma of the Iris.

IV. Gummata of the Iris and Ciliary Body.

V. Xerosis of Conjunctiva and Cornea, following long-standing Gelatinous Trachoma.

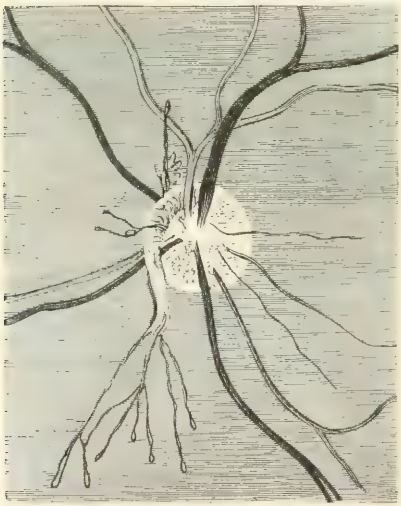
Of these the first two are capable of tolerably satisfactory representation by woodcuts, and are here reproduced, with histories of the cases.

I. VASCULAR NEW GROWTH IN THE VITREOUS.

M. J. C., æt. 28, an unmarried Irish girl, of light hair and florid complexion, with all the external appearances of being well nourished and in good health, and without any marks or history of spe-

cific disease, presented herself, July 13, 1877, complaining of dim vision, and stating that in February previous, for two days and a night, she had had such severe headache "that she almost went crazy," and that about a month afterward the eyesight commenced to fail. Inasmuch as she cannot read, it is difficult to determine accurately the acuity of vision, but it is probably about $\frac{20}{40}$ for the right eye, while in the left she can barely distinguish motions of the hand. The irides are blue and reasonably prompt in their response to light and shadow, the corneæ are clear, conjunctivæ healthy, and there are no marks of any previous inflammation of the eye.

The ophthalmoscope shows in the left eye great diffuse haziness of the vitreous, with numerous large black flocculi, while the right eye presents vascular loops running from the central retinal vessels forward into the vitreous, which are represented in the accompanying woodcut. Immediately in front of the lower nasal portion of the optic disk, hiding it, is a whitish gray mass which projects forward and upward. At its base are congeries of minute vessels as small as the smallest visible on the disk. Some of these form a fringe projecting downward, and from it a thin loop of vessels runs still further down, forward into the vitreous. The summit of this loop is visible with $+\frac{1}{14}$, while the disk is emmetropic. The main white stem is at its base about one-and-a-half times as thick as the largest branch of the central retinal vein at its exit from the disk. It runs upward in an S-like curve, the lower half of which corresponds nearly with the curve of the scleral ring, and from it, just below the median horizontal line of the disk, gives off a loop of small vessels toward the nasal side; and then continuing upward, curves in the opposite direction, and ends with its point extending to the nasal side. Its summit is visible with $+\frac{1}{10}$, and from it four fine blood-vessel loops project upward and forward, and two of these again



Right eye. Vitreous new growth.

subdivide. The most anterior summits of the loops are seen with $+\frac{1}{8}$.

The patient was treated with laxatives, potassium iodide, and with mercurial frictions. The medication, however, appeared to have no effect beyond diminishing the headache and slightly clearing up the vitreous of the left eye, so that in February, 1878, the patient could count fingers with it at twenty feet.

In March, 1878, she was again seized with severe headache, and became so dizzy in the street that she was afraid of being thought intoxicated, and was obliged to try and steady herself by a shop window, under pretence of examining the articles in it. In October, 1878, she complained of shooting frontal pain, and whilst coming down-stairs had an attack of syncope. When at the hospital her pulse was 80 and feeble, rising to 88 on slight exertion, and there was cardiac palpitation but no valvular disease.

In February, 1879, the patient again applied at the hospital, and was again relieved by purgatives and potassium iodide. The tops of the vessels protruded a little further into the vitreous, and there was a new loop starting from the upper inner branch. The extreme summit of the upper loop was now visible with + 7 D; the top of the white mass with + 3.50 D, while the loops to the nasal side were seen sharply with + 3 D.

The woodcut represents the growth as seen in February, 1878.

II. RECURRENT PAPILLOMA OF THE CORNEO-SCLERAL JUNCTION.

J. H. P., æt. 56, a farmer by occupation, of sallow complexion, but apparently in good health, came to me on account of a vascular cauliflower-like growth at the junction of the outer and lower segment of the left cornea with the sclerotica. The accompanying woodcut shows the exact size and position of the growth. The extreme tip of the tumor was not attached to the cornea, but the body of it was firmly adherent to its superficial layers—quite as much so as would ordinarily be the head of a pterygium in a similar position.

Recurrent papilloma.

He had observed it for several months, and it was recently growing rapidly.

It was seized with the forceps, and carefully dissected from its at-

tachments with a Beer's-knife, and after the slight bleeding had ceased, the surface and edges of the wound were lightly cauterized with nitrate of silver. The patient went home in a few days, but states that the tumor commenced to return in about a month, and five months afterward he came back with a recurrent growth of nearly the same size as that previously removed, and occupying the same position. It was again carefully dissected off from its attachments, and the wound cauterized with a minute quantity of nitric acid. A small sharpened stick of wood having been dipped into the reagent, wiped against the neck of the bottle in withdrawing it, and the small quantity then adhering to the wood was sufficient to cauterize intensely, but not deeply, the parts with which it was brought in contact, and the entire surface and edges of the wound were thus carefully cauterized.

The wound healed rapidly with a scarcely perceptible scar, and eighteen months subsequently he wrote me that there had been no recurrence.

The growth was hardened in picric acid, and sections of it showed, under the microscope, numerous vascular loops covered with epithelium, which was cylindrical in form next the vessels, and flattened and scale-like in its outer layers.

For the picture from which the woodcut was taken I am indebted to my friend, Dr. H. P. Quincy, of Boston, Mass. It represents the growth as it appeared before the second operation.

PARESIS OF INFERIOR OBLIQUE MUSCLE. By Henry D. Noyes, M.D., New York.

The symptoms of impairment of the inferior oblique muscle have been sufficiently described; but the occurrence is rare, and a case which afforded unusually good opportunity for being studied may for these reasons be considered worthy to be reported. I, of course, allude to paresis of this muscle exclusively, without any complication of other ocular muscles. Alfred Graefe (see Graefe and Saemisch, Bd. VI., erste Hälfte, p. 45) reports, among 250 cases of muscular impairment, that the inferior oblique was itself alone affected in only two instances.

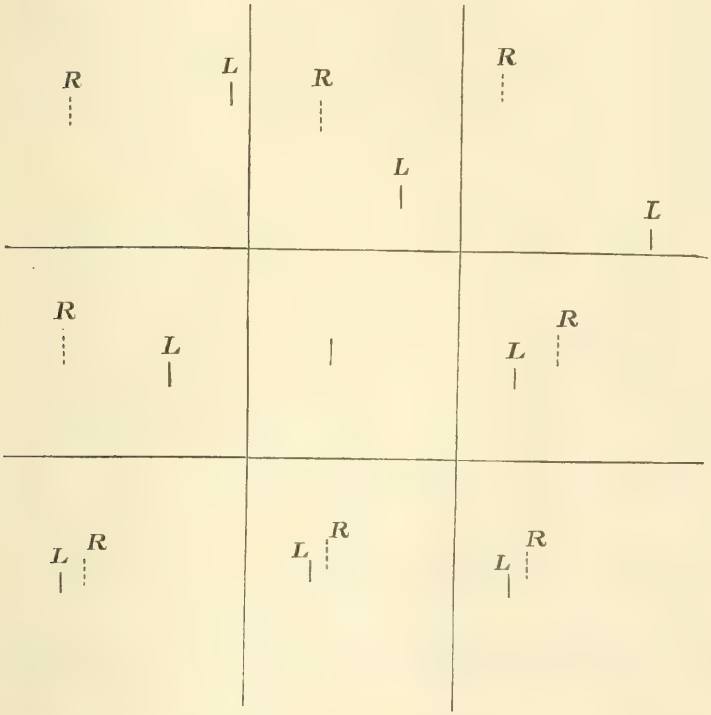
On the 5th of September, 1876, the writer was violently thrown from a horse; was for a few minutes unconscious, had bleeding from the nose, and received a laceration of semilunar form about one and one-quarter inches long, running from the body of the right malar bone upward to within one-fourth of an inch of and curving around the outer canthus. There was emphysema of the lower part of the cheek; sight was not impaired. The injury was upon the right side of the face. During the evening and about four hours after the accident, swelling came on and the wound was closed by a suture. Dr. Hankinson very kindly did what was surgically needful. While lying in bed in a room lighted by a gas-light, which shone through an open door, a well-defined scotoma was projected against the obscure walls. It had a deep crimson hue and occupied an angle of perhaps 7° to 10°. It belonged to the right eye, and was at the centre of the field. All objects could be seen through it, even fine print. This phenomenon continued for several days. Swelling took place, not only in the lids, but in the orbit, causing slight exophthalmus and some serous chemosis. The next morning double vision was observed to be present in all parts of the field. On the fifth day the swelling and exophthalmus had much abated, and the true nature of the accident could be discovered. There was a little emphysema of the cheek; clots of blood were expelled from the fauces and nares; there was slight crepitus of the malar bone and perceptible mobility. There was a sharp notch at the place of

junction between the superior maxilla and the malar bone, and another more shallow depression at the union of the ascending process of the malar with the temporal extremity of the frontal. There was a deep notch at the middle of the inferior orbital edge, and another one at the middle of the outer orbital edge. The act of chewing gave great pain when the right upper canine and its neighbors were put to use. The pain darted with great intensity along the track of the infra-orbital nerve. There was, moreover, a region of numbness covering the most of the ala nasi, and a space beneath the inferior tarsal border equal to the length of the lid and for an inch below. From all these symptoms it was plain that the malar bone had been forced backward and outward so as to be loosened from its attachments to the neighboring bones, and that a line of fracture had gone through the infra-orbital foramen and the place of origin of the inferior oblique muscle. The writer was attending to his affairs on the seventh day, and as the exophthalmus disappeared the diplopia was restricted to a region above the horizon, and did not at all interfere with ordinary vision. For a month after the injury, phosphenes would frequently occur before the right eye. They were chiefly on the temporal side; they were bright yellow and resembled the flame of a torch; they would appear on passing into a dark place, on holding the breath as in singing, on stooping, or upon any sudden movements. They invariably had a bright golden yellow color, without fading into other tints, and their duration was only for an instant. They had a bewildering effect and were disagreeable. On October 4th, Dr. Callan kindly examined the fundus of the eye and found nothing abnormal. There was absolutely no fatigue in using the eyes. By the 22d of January, 1877, the teeth of the upper jaw had recovered sensibility, but numbness of the skin in the space described continued for eighteen months. It may be assumed that this period was necessary for perfect restoration of continuity in the lacerated fibres of the infra-orbital nerve.

The double vision was from the first a subject of curious and attentive study. Five days after the injury the scheme of diplopia, as tested by a red glass and candle flame, gave for the point of direct fixation in front, single vision. At 26° above the horizon two flames appeared, and at the extreme attainable height of the line of vision the images were crossed and of different height, the false image being above, *i. e.*, the right. Along this upper range the vertical separation increased to the right and disappeared to the left, while at the extreme left the false image went a little below the

true. On this same range the lateral separation increased to the right, grew less to the left for a space a little past the medium line, and then again grew wider. Inclination of images was not noted in this examination. Along the middle range there was single vision, as stated above for the centre; to the right there was homonymous diplopia, with the false image above; to the left there was crossed diplopia, and the false image remained above. On the range below

Fig. I.



the horizon there was on the median line diplopia, with images almost above each other; the right eye image being below, to the right the right eye image went above and to the right of the left, and it held the same relations on the opposite side of the lower range. Tested by the perimeter, the region of single vision extended on the median line vertically upward 26°, downward 40°, to the right on the horizon as far as the nose would allow, viz., 45°; to the left on the horizon only to 32°. The oblique meridians were not investi-

gated. Naturally the finding of the perimeter would not accurately correspond to the region of double vision elicited by the red glass and candle. The motive for fusion of images is always less energetic when a red glass covers one eye.

On September 30, 1876, the following diagram was made. The object was a picture-frame hanging on the wall directly in front, and the angle of fixation was about 35° above the horizon. The distortion of both the vertical and horizontal meridians is very clearly displayed.

Another feature of the diplopia was discovered by carrying a horizontal rod along the upper

Fig. 2.

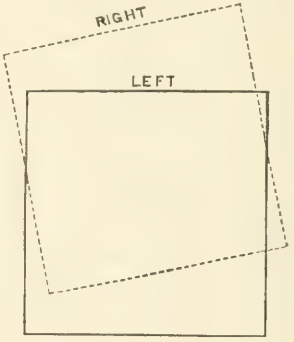
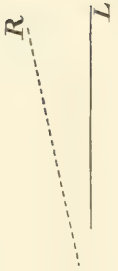


Fig. 3.



range from right to left. The two images took the subjoined relations.

The excursion was to the extreme limit on both sides, and so far that the right and left eyes were in turn unable to view the whole length of the rod. The facts displayed are that the angle of obliquity and the vertical separation increase on the right, while to the left the false image actually goes below the true and tends to become homonymous. By putting together Figures 2 and 3 it clearly appears how the vertical meridian is made to lean to the median line, and the diminution of its inclination toward the extreme left is to be construed as being in truth a great departure from the correct position, because on that side of the field the vertical meridian has an in-

clination of the opposite kind, viz., from right downward to the left.

The behavior of the vertical meridians on the horizontal range is found to be, that on the right side, when near to an angle of 45°, they remain vertical and parallel while the images are homonymous, the right image going higher. But on the left side the images are not parallel, the vertical meridian of the right eye leans to the left, and also crosses over its fellow. The diagram Figure 4 shows the situation. It would appear from this that on the extreme right the inferior oblique becomes an abductor, and to the opposite side it on the contrary serves as an adductor; by this I mean, of course, in its relations to the visual line of the fellow eye.

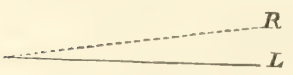
Fig. 4.

When the object was below the horizon there was still a vertical displacement of the images, the right being slightly above; but for all positions extreme right, centre, and extreme left, the images were homonymous. The amount of lateral separation was small, and slightly increased on the left as compared with the right side.

These findings were taken within two weeks of the injury. It is fair to infer that the muscle was then clogged with infiltrated blood in addition to the laceration of its fibres. Doubtless the peculiar phenomena just noticed were due to the exclusion of some bundles from action, while others were left to act in a manner not according to their usual line of direction, being unbalanced. At a much later period, viz.: ten months after the injury, it was found that double vision could not be produced until the look was elevated 25° above the horizon, and the diplopia increased steadily above that to the utmost limit of elevation, which is about 45°. To attain this height the eye must be forcibly strained up, and the eyebrows strongly lifted. At the present writing, twenty-two months after the injury, the degree of paresis remains unchanged. At the greatest elevation, the images are separated in height by an angle of less than 5°, and the

angle open to the right, made by holding a rod horizontally at an elevation of 45° is very close to 8°. Of course the vertical meridian will have the same inclination inward from the perpendicular. The attempt to decide the degree of deviation from the perpendicular, by means of the after-image, as Donders suggested, did not succeed. The faint after-image always seemed, during its brief continuance, to be quite vertical. It remains true at this moment of writing that (the eyes turned upward), when a pen-holder is held vertically at arm's length in the upper right corner of the field, it forms double images, of which that seen by the right eye is to the left, is higher and inclined medially, and seems nearer; the other image appears to slope away at the top. This crossing of the images is distinct, and disappears when the object comes half way to the median line; when brought to the median line, one image is directly below, and on a line with the other—the vertical separation being about one-half that found on the extreme right. At about 20° to the left of the median line, single vision takes place. This contradicts, so far as the crossing of the images is concerned, the statement of Prof. Alfred Graefe (see Graefe and Saemisch, l. c., p. 54), who indicates that the images are homonymous. I may remark that my ocular muscles have always been exceptionally strong—that I could fuse images separated by prisms amounting to more than 50° with bases outward, and could overcome prisms of 8° with bases inward—the object being at 20 feet distance. That the right eye is hypermetropic $\frac{1}{30}$, the left hypermetropic $\frac{1}{48}$. That there never have been any symptoms of asthenopia. How to reconcile the discrepancy above noted between this case and the statement of Prof. Graefe, I shall not attempt. That the lesion in my own case befel the right inferior oblique muscle, does not seem to me to admit of a doubt; that any other muscle has been implicated, seems equally devoid of evidence. The insertion of the inferior oblique is by a broad and fan-like expansion, and perhaps the explanation of the above discrepancy between my own symptoms and the statement in Prof. Graefe's article, may be, that in my own case only the fibres of the muscle going to the outer side of its insertion were impaired, and that in this way the adductive power was impaired for the position in question.

Fig. 5.



TUMOR OF THE OPTIC NERVE. By Dr. H. Knapp, of New York.

Though the publications of cases of optic nerve tumors have become so numerous during the last eight years that the disease ceases to be considered as a rarity, I may expect that the case I beg to present, may not be found devoid of interest on account of some peculiar features it offers.

Clinical History.—Jac. Günther's two-year-old son, of Glenville, L. I., was brought to my office, Oct. 14, 1878. Dr. T. R. Pooley, who replaced me during my absence at that time, saw the child and put into the case-book the following note: "Four or five weeks ago child fell. Since then parents noticed protrusion of right eye and vision failing. Decided exophthalmus. No limitation of mobility. Opthalmoscopic examination exceedingly difficult, on account of child's restlessness. No abnormality noticed. *Diagnosis:* Exophthalmus traumaticus R."

Some weeks later I saw the child at the N. Y. Ophthalmic and Aural Institute. The exophthalmus was considerable, and both Dr. Pooley and myself could recognize well-marked optic neuritis. The protrusion was straight forward; mobility unchecked; no abnormal condition to be detected in orbit. *Diagnosis:* Tumor of the optic nerve. I mention that no bruit was heard over the eyeball or its surroundings, since the alleged traumatic origin suggested exophthalmus by an arterio-venous communication in the cavernous sinus. The protrusion increasing steadily, the mother was advised, in November, 1878, to have the supposed optic nerve tumor removed, with preservation of the eyeball, if possible. She consented, but on account of some general illness of the boy, she brought him back only on January 4, 1879, when, with the kind assistance of Drs. Pooley, Born, and others, I performed *the operation.*

As soon as the conjunctiva was opened on the nasal side below the internal rectus, the finger felt a cylindrical tumor connected with the posterior end of the eyeball. By turning the eye and drawing the lips of the wound apart, the tumor was brought into view. It had a white, smooth surface, a diameter of from 8 to 10 mm. and was moderately hard. It was detached from its connections all around,

cut through first at the central end, close to the optic foramen, then at the peripheral end close to the sclerotic, and removed without difficulty. The conjunctival wound was united by sutures. The eyeball, the inner half of which was anæsthetic, and the muscles of which had not been touched, was replaced, but it continued protruding considerably, on account of which the lids were united over it by a strong suture.

Jan. 5.—Lids swollen. No discharge.

Jan. 6.—Suture of lids giving way.

Jan. 7.—Lower half of cornea exposed. Cornea kept moist with milk.

Jan. 8.—Almost the whole cornea exposed; more chemosis; difficult to keep the eye moist and preserve the epithelium. The protruding eyeball pushed back, lids united over it by two sutures.

Jan. 11.—Sutures cut through again. Central opacity of cornea.

Soon the whole cornea sloughed, the protruding iris was cut off, and the little patient was discharged from the hospital with a shrinking eye on January 20, 1879. During the next month some swelling was felt in the upper part of the orbit and referred to a local relapse of the tumor, the distal end of which, at the operation, was as thick as its centre, leaving no doubt that the tumor had only partially been removed. This swelling in the orbit, however, disappeared gradually. The child has grown pale, is very weak, takes no interest in anything, and though there have not been, up to this time, any marked cerebral symptoms, I do not doubt that the tumor extends into the cranial cavity and will destroy the child's life.[1]

Anatomical Condition of the Tumor.—The specimen which I pass round—and of which the accompanying figure is a sketch in natural size—measured 30 mm. in length, 7 mm. in thickness at its distal, and 15 mm. at its proximal end, representing a truncated, somewhat irregular cone, with a slight angular bend in its middle portion. It was softish, about

[1] Oct. 1, 1879. The child was brought to the Institute again last week. There was no local relapse, no abnormity at all in the orbit, except the greatly shrunken eyeball. The boy was very anæmic and emaciated; his head appeared larger. The mother stated that for some weeks she had noticed that he was losing the sight of the other (left) eye. No external abnormity, in particular no protrusion, could be discovered in this eye, but the ophthalmoscope showed the picture of choked disk well marked, making almost certain the supposition that a pseudoplasm was in the cranial cavity and had caused neuritis descendens.

the consistence of muscle-tissue, and surrounded by a smooth, fibrous capsule, the outer sheath of the optic nerve. The cross-section of the scleral end showed the fairly normal looking optic nerve surrounded by soft fibrous tissue, filling the increased intervaginal space, and adhering to both sheaths, more intimately, however, to the outer than to the inner. The cut-surface of the proximal end appeared uniformly lardaceous, and surrounded by the fibrous capsule, the dilated and thinned outer sheath. The optic nerve was not recognizable at this end. A longitudinal section showed the nerve in about half of the tumor as a compact cord, of the natural thickness at the scleral end, but thinning in the middle portion and losing itself in the central third of the tumor. Near the sclerotic the arrangement of the fibre bundles of the optic nerve was as usual, but in the middle portion numerous small round cells filled the interfascicular spaces, which more and more widened, so that at the beginning of the inner third the nervous fibre tracts scattered fan-like and irregularly into the substance of the pseudoplasm.

This substance consisted of several elements with a different arrangement in certain portions of the tumor. In the peripheral and middle thirds the prevailing structure was a net-work of delicate, partly parallel, partly irregularly arranged fibres, the appearance of which was exactly like that of the fibres within the optic nerve. Between the fibres were numerous smaller and larger corpuscles with well-defined large nuclei, filled with shining granules. In the proximal third of the tumor the delicate fibres were scanter and the cellular elements prevailed. In some places larger cells were densely crowded with but little intercellular substance, showing the characters of sarcoma. Softer portions of the tumor were formed by an almost uniform accumulation of lymphoid corpuscles, as we find in glioma. In some places the substance was viscid, the clusters of smaller and larger cells were crowded aside by an anastomosing net-work of long delicate fibres, the crossing points of which dilated into triangular spaces enclosing nuclei. The matrix was homogeneous, containing some small round cellular bodies. Since these portions exhibited the structure of myxoma, the whole specimen should be termed: A MYXOMATOUS GLIOSARCOMA OF THE OPTIC NERVE.

The *peculiar features* of the case are:

1. The alleged traumatic origin of the tumor.

2. The easy removal of the growth, without dividing any muscle and without sacrificing the eyeball.

3. The subsequent destruction of the eyeball by sloughing of the cornea from exposure.

4. The extension of the growth into the cranial cavity, causing, in the course of nine months, neuritis descendens.

It is not likely that the pseudoplasm originated in the cranial cavity, particularly in the optic chiasm, since then it would probably have extended into both orbits before this time. As the proximal end of the tumor was the thickest and showed the most advanced changes, it is not impossible that the fall of the child had injured the region of the right optic foramen, producing an irritation in the optic nerve which was the starting-point of the pseudoplasm.

A CASE OF SARCOMA OF THE CHOROID, REMOVED AT AN EARLY STAGE. By Dr. H. Knapp, of New York.

Last March, a man, æt. 39, came to me, stating that about four months previously he accidentally discovered that he could see nothing distinctly with his right eye. Since that time his sight had not materially changed. He never had had pain, inflammation, or any inconvenience from that eye. When I examined him I found a sector-like scotoma, which extended from the point of fixation downward and inward, occupying the greater part of the inner-lower quadrant of the visual field. The ophthalmoscopic examination at once accounted for the visual defect. A tumor of about four papillæ diameters occupied the region of the yellow spot and the adjacent part upward. It was roundish, covered with retina, and had a system of blood-vessels of its own. It was yellowish-red. Its crest showed $H\frac{1}{4}$ or $H\frac{1}{3}$, the remainder of the fundus being emmetropic and normal. The estimated elevation of the tumor was, therefore, between three and four millimetres. The diagnosis of a choroidal tumor being evident, the sector-like defect in the visual field proved that the conduction of the retinal fibres passing over the tumor was abolished.

I removed the eyeball soon afterward. The anatomical examination of the specimen, of which I have the pleasure of presenting one-half, confirmed the diagnosis in all its particulars. The tumor was a vascular sarcoma of the choroid. The retina passing over it

was intimately connected with its surface. It measured six millimetres in its longest diameter, and was four millimetres high.

I think there are not many choroidal tumors on record that are smaller than this. I have made an elaborate ophthalmoscopic drawing of the fundus oculi, a perimetric determination of the visual field; and since the case offers several interesting features, I contemplate publishing it in detail in the *Archives of Ophthalmology*.

THE DIFFUSION CIRCLES OF AMETROPIA.

By Albert G. Heyl, M.D., of Philadelphia, Pa.

When rays from a mathematical point of light pass through the refracting apparatus of an eye, they meet again in a mathematical point; should this focal point lie either before or behind the retina, we have formed on the retina a diffusion circle. Moreover, if an object possessing magnitude occupy the place of the light point, we shall have formed on the retina a number of diffusion circles forming a diffusion image.

It is my purpose at present to ascertain something about the *diffusion circles* as they occur in the varieties of ametropia known as hypermetropia and myopia; to ascertain if any difference worthy of note obtain between the diffusion circles as they actually exist in the cases which present themselves to us in the routine of practice and the typical hypermetropia or myopia which may be made to exist in the diagrammatic eye, and to draw one or two practical deductions from the results.

In pursuing this plan, I shall take the diagrammatic eye, ascertain the diameters of the diffusion circles corresponding to certain grades of hypermetropia and myopia; these grades being supposed to depend on alterations in the length of the axis of the eye. I shall then ascertain the diameters of the diffusion circles of actual eyes which were characterized by the same grades of ametropia. I have been able to do this by means of the measurements of certain ametropic eyes made by Professor Mauthner, and given in his work on Anomalies of Refraction.[1]

I shall, for the present, defer all reference to the methods of cal-

[1] Optische Fehler des Auges, pages 642, 644.

culation, and simply tabulate the results. The calculations were made with the supposition that the accommodation was entirely at rest, the pupil having a diameter of 4 mm. and the rays of light coming from a mathematical point situated at an infinite distance. I shall give first the hypermetropic table:

HYPERMETROPIC TABLE.

	H. $\frac{1}{40}$		H. $\frac{1}{12}$		H. $\frac{1}{6}$	
Corneal curve.....	7.829	7.77_{375}	7.829	7.622	7.829	7.480
Length of axis.....	22.528	23.39	21.849	22.37	20.903	21.26
Shortening	.295	.494	.974	1.16	1.920	1.926
Diameter of diffusion circle.....	.064	.102	.212	.244	.419	.412
	D.	M.	D.	M.	D.	M.

In this table there is reference made to three grades of hypermetropia, $\frac{1}{40}$, $\frac{1}{12}$, and $\frac{1}{6}$. Two columns are devoted to each grade, one having reference to the diagrammatic eye, marked D., the other referring to the eyes reported in Mauthner's work, having underneath it the letter M.; the names to the left show to what the figures refer; thus, in hypermetropia $\frac{1}{40}$ in the diagrammatic eye we have a cornea with a radius of curvature of 7.829 mm., a shortening of axis of .295 mm., and a diffusion circle of .064 mm. in diameter. In Mauthner's eye of the same grade of hypermetropia, the corneal curve has for its radius 7.77_{375} mm.; the shortening is .494 mm.; the diffusion circle .102 mm. in diameter. The figures representing the corneal radius and length of axis in Mauthner's eyes have been derived from his table; those representing the shortening and the diffusion circles have been calculated by me, as also the same quantities in the diagrammatic eye. Allusion should be made to an error in Mauthner's table, which is apt to mislead. The length of the axis of the eye with H. $\frac{1}{40}$ is given as 22.39 mm.; this axis is so short that the diffusion circle formed on its retinæ would be larger than that in the eye with H. $\frac{1}{12}$, given in the same table. Further, by examining Mauthner's table, it will be seen that Case No. IV. has a hypermetropia $\frac{1}{9}$; its corneal curve and its length of axis are practically the same as that of the H. $\frac{1}{40}$; so that we have the paradox of eyes of the same corneal curve and the same amount of shortening present-

ing vastly different grades of hypermetropia. The error is doubtless due to the printer, and has been overlooked in the proof-reading. The proper number is given in my table. Let us turn now to the consideration of this table.

In the lowest line of figures we have given the diameters of the diffusion circles of three different grades of hypermetropia. Let us notice:

1. The relative lengths of these diameters. A glance shows that in H. $\frac{1}{40}$ and H. $\frac{1}{12}$, Mauthner's eyes, the diameters are longer than in the corresponding grades of the diagrammatic eye; while in the H. $\frac{1}{6}$ the reverse is the case, although the difference is not so marked.

2. The relations which exist between the different grades of hypermetropia and the different diameters. A glass hypermetrope of $\frac{1}{6}$ in the diagrammatic eye is 1.94 as strong as one of $\frac{1}{12}$, and a glass hypermetrope of $\frac{1}{12}$ is 3.4 times as strong as one of $\frac{1}{40}$. The very same relation exists between the corresponding diffusion diameters. The diameter of the circle of H. $\frac{1}{12}$ D. E. is .212 mm.; it is 3.4 the size of the diameter of H. $\frac{1}{40}$. This kind of relation does not exist in Mauthner's eyes. Take the grades last mentioned, and the diffusion diameter of H. $\frac{1}{12}$, .244 mm. in length, is only 2.3 times as large as that of H. $\frac{1}{40}$.

We see, then, that in the diagrammatic eye the diameters of the diffusion stand in fixed relation with the grade of the anomaly, proportionately increasing in length with the increase in grade. In eyes which meet us in clinical experience this is not the case; no definite rule is followed. We cannot say that in Mauthner case of H. $\frac{1}{40}$ that the diameter is abnormally long, nor that in H. $\frac{1}{12}$ it is unusually short. The true statement would seem to be that in cases presenting themselves to us in the routine of practice, that the same grades of hypermetropia may be characterized by different sized diffusion circles. I suppose, of course, as already stated, that the accommodation is at rest and the pupil of the same size.

Every one who examines the subject closely will soon find that two distinct eyes may be characterized by the same grade of hypermetropia, and yet vary very much as regards their corneal curves, lengths of axes, etc. One need only consult Mauthner's tables to see this. I wish now briefly to illustrate the effect of these variations in the diffusion circles. Let us notice:

1. Variation in corneal curve. Take a corneal curve of 7.62_{285} mm. radius and one of 7.96_{390} mm. radius. Suppose the value of

the crystalline lens to be that of the diagrammatic and the diameter of the pupillary image to be 4 mm.; for the sake of convenience, I will make the depth of the anterior chamber 3.8 mm., as I happen to have calculations in hand made with that value. If now I induce a glass hypermetropia of $\frac{1}{12}$ in each eye, the diffusion diameter of the eye with the stronger corneal curve will be .203 mm., with the weaker curve .207 mm., the difference between them being .004 mm.

2. Variations in the size of pupil. The effect of this on the diffusion circles is recognized by all. I need not therefore specially refer to it at this time.

3. Variations in the position and focal distance of the crystalline lens. Our present knowledge about the focal distance of the crystalline is too defective to enable us to calculate its influence. With regard to the position of the lens, however, a few words may be said. The distance of the anterior surface of the lens in the diagrammatic eye is estimated at 3.6 mm. Some variations from this exist in individual eyes. For the sake of illustration, take the cornea with a radius of 7.62285 mm., and combine with it the diagrammatic lens, its interior surface 3 mm. from the cornea. Let the diameter of the lenticular image of the pupil be 4 mm.; the diffusion diameter in a glass hypermetropia of $\frac{1}{12}$ in this eye will be .195 mm. Take this eye and simply move the lens .8 mm. further back, so that it is 3.8 mm. from the cornea, and the diffusion diameter will be .203 mm.

Once more, take a weaker corneal curve, one of 7.96390 mm. radius, with a lens distance of 3.8 mm. With the same refraction anomaly and the same sized pupil the diffusion diameter will be .207 mm.

From this we learn that it is possible for different diffusion circles to occur in eyes presenting the same grade of hypermetropia. The question now presents itself as to the power of such minute differences as exist between the diameters just given to produce any practical change in the sensation of sight. In answer to this, it must be remembered that the quantities given are diameters merely, and do not represent the circles themselves. To fully answer the question, we must calculate the areas of the circles and find the difference between them; this is readily done. If now we can ascertain the number of retinal cones which can be packed into this difference of areas, we shall be in a position to answer the question. I have been unable to find any account of the number

of cones found in a given area of the fovea centralis, but we may roughly estimate it in this way: We know that the diameter of a cone is about .003 mm.; we can then calculate the area of the top of cone, just as we would calculate the area of circle; we can then find how many such areas would be contained into the difference of the areas of the two diffusion circles. This estimate, doubtless, falls short of the truth, but we can see in this way that even such minute differences in the diffusion diameters produce very sensible impression on the macula.

From all this I draw the conclusions—

1. That, by virtue of the constantly varying structure of the human eye, cases may occur presenting the same grade of hypermetropia, but possessed of varying diffusion circles.

2. That, consequently, the diffusion circles of different grades of hypermetropia do not always stand in the same proportion the one to the other.

Practical deductions flow from these conclusions. As, however, they belong more properly to the subject of diffusion images of ametropia, I shall simply indicate one or two:

1. One reason why certain patients with weak grades of hypermetropia suffer with such pronounced symptoms of asthenopia. Cases with relatively large diffusion circles would feel the imperative necessity of covering the defect by increased accommodation and of maintaining this increased accommodation with absolute rigor. It may also be suggested that the usefulness of weak cylinder glasses, *e.g.*, $\frac{1}{48}$, or even $\frac{1}{60}$, may find an explanation in this condition.

2. The bearing of this on the etiology of strabismus convergens. Not that I would adduce this condition as an actual cause of strabismus, determining the existence or non-existence; but supposing that strabismus is, for any reason you please, to take place, what shall be its character?—shall it be monolateral or alternating? Take a typical case, grade of refraction the same, visual acuteness the same in both eyes, and yet in the one case you will have monolateral, in the other alternating squint. Why is this? The varying diffusion circles will explain it. Given in the one case equal diffusion circles, and it is a matter of indifference to the patient which eye is used and which shall squint. Given again a larger diffusion circle in one than the other, and both reason and clinical experience show that the eye which possesses the greater facility for sight will be the fixing and the other the deviating organ. Let us turn now to the myopic table.

MYOPIC TABLE.

	MYOPIA 1-20.		MYOPIA 1-12.			MYOPIA 1-10.		
Corneal curve..	7.829	8.155	7.829	7.736	7.2484	7.829	7.736	7.4807
Length of axis	23.421	25.42	23.828	24.798	23.49	24.030	25.05	24.347
Lengthening.	.598	.634	1.0025	.998	.87	1.207	1.25	1.16
Diam. of diffusion circle.	.1306	.125	.2189	.207	.192	.2636	.259	.256
	D.	M.	D.	M.	M.	D.	M.	M.

In this table mention is made of three grades of myopia, the diffusion diameters are calculated for each grade in the diagrammatic eye; in Mauthner's eyes, one eye of $\frac{1}{20}$, two of $\frac{1}{12}$, and two of $\frac{1}{10}$ are taken, and the diffusion diameters calculated. A glance at the lowest line of figures will show that the diameters in Mauthner's eye are in every case smaller than in the corresponding grade of the D. E. Examination will likewise show that while in the diagrammatic eye, the diameters stand in the same fixed relation to each other as the grades, in Mauthner's eyes variations exist. The same interest, however, does not surround the myopic and hypermetropic tables; the practical bearing of the latter is greater. I shall therefore simply call attention to one point. Mauthner,[1] in his splendid work so often already alluded to, thus refers to the relative acuteness of vision of myopes and hypermetropes: "If we make the visual acuteness depend only on the size of the diffusion circles . . . . a hypermetrope of a certain grade will have a greater visual acuteness than a myope of the same grade," provided both anomalies depend on axis change. This he proceeds to demonstrate by the diagrammatic eye, showing that the diffusion diameter in the myope would be greater than that of the hypermetrope.

Now all this is true enough of the diagrammatic eye, but it is not always so in actual practice, as a comparison of the two tables will show. In Mauthner's eye of H. $\frac{1}{12}$, the diffusion diameter is .244 mm. while on the M. $\frac{1}{12}$, in one case the diameter is .207 mm. in the other .192 mm.; *i.e.*, the acuteness of vision if depending solely on the diffusion circle would be greater in these myopes than in the hypermetrope. It should be remembered, that while the corneal

[1] Optische Fehler des Auges: Mauthner, page 152.

curves vary so much in these eyes of Mauthner, they are, nevertheless, to be looked upon as true cases of axial ametropia. I have thus endeavored to unfold a few thoughts in connection with the diffusion circles of ametropia; much more could be said, but time and space forbid; perhaps these glittering specks, chipped from their rocky hold, may indicate the spot where veins of precious truth are stored.

Mathematical Demonstration.

I propose now to demonstrate the methods pursued in calculating the diameters of the diffusion circles, both in the diagrammatic eye, and in the eyes measured by Mauthner. Before so doing, I wish to state the suppositions which underlie the demonstration.

1. I have supposed the pupil to have a diameter of 4 mm. As, however, it is the enlarged image of the pupil, and not the pupil itself, which forms the base of the cone of rays converging to the focal point, we must calculate its size and also its position. The magnified image[1] is 4.1754 mm. in diameter, and is situated 3.7052 mm. behind the corneal vertex.

2. I have supposed the loci of the first principal points of the eyes, as well as the loci of the anterior surfaces of the lenses, to be the same as those of the Helmholtz diagrammatic eye.[2] Of course these values vary in different eyes, this variation, however, cannot materially affect the conclusions I have drawn.

3. In speaking of a given grade of hypermetropia or myopia, I mean the hypermetropia or myopia which required for its correction a glass of that grade placed 9 mm. before the cornea.

4. I have supposed the crystalline lens in the eyes recorded by Mauthner to be equal in power[3] to a glass convex spherical lens of 88 mm. focus placed 9 mm. before the cornea; or, to put it in other words, were one of these eyes deprived of its lens a glass lens of the above description would enable the eye to bring rays to the same focus as when its lens was in place.

In ascertaining the diameter of a diffusion circle in any eye, we require the diameter of the lenticular image of the pupil, its distance

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[1] Dioptrik des Normalen Auges, page 141.

[2] The Helmholtz Diagrammatic Eye: Dr. N. G. Heyl's Archives of Ophthalmology, vol. viii., p. i.

[3] Optische Fehler des Auges: Mauthner, page 233.

from the posterior focus of the eye and the amount of lengthening or shortening of the axis.

In the diagrammatic eye these data are readily obtained; the diameter of the apparent pupil 4.1754 has already been given; its distance from the posterior focus of the eye is found by subtracting its distance from the vertex of the cornea from axis of the diagrammatic eye, it is equal to 19.1184 mm. The degree lengthening or shortening of the axis in a given case of ametropia is easily found by the formula $l_{,}\, l_{,,} = \phi_{,}\, \phi_{,,}$ Let me illustrate its use. I wish to ascertain the amount of shortening which takes place in H. $\frac{1}{40}$. 40 Parisian inches is equal to 1082.8 mm.; to fulfil the requirements of this case, rays which strike the eye so convergent that they would meet 1082.8 mm. behind the first principal point of the eye, if not acted on by the refracting apparatus of the eye, when refracted, come to a focus on the retina; but the grades of refraction spoken of in the preceding discussion are determined by a *glass* of that grade placed 9 mm. from the cornea, or 10.7532 mm. from the first principal point. The point, therefore, toward which the rays converge before undergoing refraction, is 1082.8 − 10.7532 = 1072.0468 mm. from the first principal point. As $l_{,}$ is equal to the distance of the first principal point to the anterior focal point of the eye, it is equal to 1072.0468 + 15.498 = 1087.544 mm.

$1087.544\, l_{,,} = 15.498 \times 20.713 \cdot\cdot l_{,,}$ then, is equal to .295 $l_{,}$, being a minus quantity, $l_{,,}$ would also be negative—*i. e.*, it would mean .295 mm. reckoned from the posterior focal point in a negative direction; all distances reckoned from the posterior focal point toward the cornea being negative, and all distance reckoned in the contrary direction being positive; $l_{,,}$, then, in this case, being negative, indicate .295 mm. shortening of the axis.

I have now all the data necessary for finding the diameter of the diffusion circle. I have the size of the apparent pupillary plane, its distance from the posterior focus of the eye; these form the base and altitude of one triangle. There is a similar triangle having for its base the diameter of the diffusion circle, and for its altitude the amount of shortening of the axis. As these triangles are similar, the altitude of the one will be to that of the other as their bases, or 19.1184 : .295 :: 4.1754 : .064. .064 mm. is then the diameter of the diffusion circle in the given case.

Let me now briefly explain the method pursued in finding the diameter of the diffusion circles in Mauthner's cases. Here a different method must be pursued, because each individual case has its

own corneal curvature and its own amount of shortening. The data in Mauthner's tables available for our purpose are the radius of corneal curvature and the length of the axis. We need to find the distance of the posterior focus from the cornea, and then the amount of shortening is easily found, as the length of axis is given in the table.

To find, however, the position of the posterior focus, it is necessary not only to know the radius of the corneal curve, but also the focus of the crystalline lens, its position as regards the cornea, the index of refraction of the vitreous and aqueous humor. The data regarding the crystalline lens are not given in the table, and recourse is had to the following device to supply the deficiency. Examination of aphakous eyes shows the value of the crystalline lens to be equal to a glass convex lens of 88 mm. focus, placed 9 mm. away from the cornea. Rays, then, which have such a direction that they would meet at a point 79 mm. behind the cornea are so refracted by the cornea that they meet in the posterior focus of the eye. This is true of the emmetropic eye, and as clinical experience shows that the value of the lens in ametropia differs very slightly from that in emmetropia, we may consider that if rays having a direction such as would cause them to meet 79 mm. behind the cornea are refracted by this latter, they will meet in the posterior focus of the eye. Let me illustrate. In Mauthner's case of H. $\frac{1}{4^{1}_{0}}$; the corneal radius is 7.77_{375} mm. The formula which we use here reads: $\frac{n_{,}}{f_{,}}+\frac{n_{,,}}{f_{,,}}=\frac{n_{,,}-n_{,}}{r}$. This formula has reference to a single refracting surface, like the cornea, r being its radius; $n_{,}$ being the refraction index of the medium before the refracting surface; $n_{,,}$ that of medium behind it; $f_{,}$ is the distance of point of light, whence the rays issue, to the refracting surface; $f_{,,}$ is distance of the focal point from refracting surface. All these quantities, with the exception of $f_{,,}$, are known to us, viz.: $n_{,}=1$. $n_{,,}=1.3365$, $r=7.77_{375}$, $f_{,}=-79$, because it is a negative distance as regards the cornea. Substituting these we have $-\frac{1}{79}+\frac{1.3365}{f_{,,}}=\frac{.3365}{7.77_{375}}$ $f_{,,}=23.890$ mm. 23.890 mm. is then the distance of posterior focus of the eye from the cornea. The axis of the eye given in the table is 23.396; the amount of shortening of the axis would be the difference, or .494 mm.

I have now simply to ascertain the distance of the posterior focus from the pupillary plane, and I have all the data requisite for finding the diffusion circle as before.

I have accepted the same position and size for the apparent

pupil as in the diagrammatic eye. The distance of the apparent pupil from the posterior focus would be 23.890—3.702, or 20.185. The proportion, then, for the diameter of the diffusion circle would be : 20.185 : 1.494 :: 4.1754 : .309.

I have thus, as briefly as possible, indicated the method pursued in finding the diameter of diffusion circles in hypermetropia. The same general plan has been pursued in the cases of myopia, varied, of course, with altered condition of the problem.

ISCHÆMIA OF THE RETINAL VESSELS OF BOTH EYES, FOLLOWING FACIAL ERYSIPELAS.

By David Coggin, M.D., Salem, Mass.

In his recently published *Thérapeutique Oculaire*, De Wecker states, that "up to this time double embolism has not been met with."

As a case in which I at first thought this condition existed lately came to my notice, it may not be considered unworthy to be placed upon record.

On the 6th of last April, in consultation with Dr. G. S. Osborne, of the adjacent town of Peabody, I saw Mr. B., an American, aged 62 years, a surveyor by occupation, married, and the father of several children. His eyesight had always been excellent. His health had also been good, and there was no history of any rheumatic or cardiac trouble.

Eighteen days previously he had been taken down with facial erysipelas.

His eyelids became greatly swelled, and the skin of half the upper lids sloughed.

On the subsidence of the infiltration, so he could raise his lids, he found he was quite blind, but he was unable to say whether his sight had left him suddenly.

There had been no delirium and his temperature had not exceeded 102° F.

At the time of my visit his lids were still closed, and he could not raise them enough to allow a satisfactory view of the corneæ. The ulcers left by the sloughing were irritable and they bled easily.

On elevating the lids by pressing up the cartilage, the corneæ were seen to be so denuded of epithelium as to render futile the use of the ophthalmoscope. The pupils had been kept dilated by atropine.

The tension was normal, and no pain was present, nor had the patient complained of any. There was marked chemosis, more particularly of the left eye, where the conjunctiva protruded between the lids, near the caruncle, and from which blood frequently oozed.

Three weeks later the loss of substance in the upper lids had been nearly replaced, and without ectropion. The patient could half open his eyes, and he could also rotate them slightly, which he had been unable to do earlier. Some chemosis remained in the left eye and with moderate exophthalmus.

Pupils dilated, though the use of atropine had been suspended.

The corneæ had become sufficiently clear to allow a fair view of the fundus by the direct method. The lenses and vitreous were normal.

The retinal vessels of the right eye were empty and presented a striking arborated appearance. The vessels in the left eye were also bloodless, save the one passing upward, which divided into two branches just beyond the disk-border and contained blood so far toward the periphery as I was able to follow, while a second vessel, issuing from the disk beneath and to the right of the first, became abruptly anæmic on reaching the papillary margin.

I was unable to determine whether these vessels were arteries or veins.

Both disks were of a grayish-white color and no small disk-vessels were visible.

In neither eye was there observed the cherry spot met with in cases of recent embolism.

There was no perception of light in either eye. Dr. Robert Willard, of Boston, saw the patient subsequently and, still later, Dr. Hasket Derby.

As there had been no symptoms indicating cardiac or arthritic trouble, and as the two eyes were apparently simultaneously affected, it is probable that this case was not one of embolism but rather of thrombosis. It is likely that the ischæmia resulted from the propagation of the erysipelatous inflammation beneath the capsule to the optic nerve, upon which it exercised enough pressure to retard the circulation of the blood in the retinal vessels and thus occasion thrombus, or it may have been caused, again, by thrombosis due

to the extension of the inflammatory process to the vessels themselves.

Without doubt there was severe inflammation in the orbit, with serous or plastic infiltration, as was shown, I think, by the exophthalmus, chemosis, and impaired mobility of the eyes.

Now assuming that absorption had been going on we should ultimately expect to find a subsidence of these symptoms, as was the case.

The patient had received the supporting treatment that is ordinarily adopted (with the addition of iodide of potassium).

I gave an unfavorable prognosis, but suggested the tentative inhalation of the nitrate of amyl and a sclerotomy, as is recommended by De Wecker, but the patient decided to have nothing further done.

Two weeks ago, when I last saw the patient, the condition of things was practically unchanged. The eyes presented a nearly normal appearance externally, while the ophthalmoscope revealed no further changes, save that the empty vessels were less readily seen in their entire course as they had dwindled away in some places and had become indistinct, while in others they gave a glistening white reflex. In the left eye the vessels containing blood looked as they did when first seen, but there still was absolute blindness.

A CASE OF APPARENT ATROPHY OF THE OPTIC NERVE, IN WHICH RECOVERY OF EYESIGHT FOLLOWED THE USE OF HYPODERMIC INJECTIONS OF NITRATE OF STRYCHNIA. By David Webster, M.D., of New York.

A stableman, aged 26, American and unmarried, presented himself at the Manhattan Eye and Ear Hospital, New York, on the 28th of April, 1879. He was so blind that he had to be led to the hospital by his friends. He stated that his general health had always been good; that he had never suffered from venereal disease of any kind, and that he had never used tobacco or spirits immoderately. His heart and kidneys were examined, and believed to be sound. He seemed, however, to be the subject of a certain amount of mental hebetude.

He said that when 13 years of age he had been struck with a stick on or near the right eye. Very soon after the blow the eye became totally blind; he had great pain in the head, with delirium, following the injury, and was confined to his bed for six weeks.

He saw perfectly well with the left eye until two-and-a-half years ago, when it was injured by a blow from a piece of metal. This injury was followed by dimness of vision, some pain in the eye, and a slight discharge from between the lids. The vision improved after a few weeks, but soon began again to fail, and has continued to grow worse, until now he has to be led about.

Before I saw the patient, his vision was tested by Dr. D. R. Ambrose, one of the Assistant Surgeons, and by Dr. H. F. Stowell, the House Surgeon, both of whom found that he had no perception of light in his right eye, and that with his left the best he could do was to count fingers at twelve inches. Although no mydriatic had been used, both pupils were dilated about two-thirds, and he had marked nystagmus, with a great deal of nictitation.

His eyes were examined with the ophthalmoscope by Dr. D. B. St. John Roosa, Dr. D. R. Ambrose, Dr. H. F. Stowell, myself, and several others, all of whom concurred in the diagnosis of very far advanced atrophy of both optic nerves. An unfavorable prognosis

was given, and, on the same day, Dr. Stowell gave him a hypodermic injection of one-eightieth of a grain of nitrate of strychnia.

On the following day (29th), I examined the patient and found, to my surprise, that both the nystagmus and the nictitation had disappeared, and that the vision of the left eye had risen to $\frac{2}{4}\frac{0}{0}$.

The patient remained in the hospital, and received a daily hypodermic injection of nitrate of strychnia, the dose being increased daily by one-two-hundred-and-fortieth of a grain. In a week the vision of the left eye had increased to $\frac{2}{3}\frac{0}{0}$, and it was noted that the visual field was normal, except that there was a slight limitation in its upper part.

On May 11th, about two weeks after his admission, the dose of strychnia had reached one-fourteenth of a grain without having produced the physiological effects of the drug, and the vision of his left eye, as tested by myself, had risen to $\frac{2}{2}\frac{0}{0}$. The right eye remained sightless, and the ophthalmoscopic appearances of both eyes were the same as when first examined. The patient was discharged, and I have not heard from him since.

I think the case may be placed upon record as a unique one. The patient was not an applicant for a pension, and I could learn of no motive for malingering. Had he been a malingerer, it seems highly probable that it would have been detected, examined as he was by so many, and so carefully. Were *simulation of vision* possible in cases of blindness, I should have suspected him of *that*, judging from ophthalmoscopic appearances.

PLASTIC OPERATIONS AT THE INNER CANTHUS. REPORT OF THREE CASES. By Henry D. Noyes, M.D., New York.

I beg to call attention to a method of repairing deficiencies about the inner portion of the lower eyelid by sliding the whole cheek, together with the remaining portion of the shortened lid, inward and upward. Not only is this method available for lesions of the lower lid, but it applies also to cases where the skin over the lachrymal sac has to be removed, as one of the cases to be cited will illustrate. I present this method as one which has not been described in the text-books. It has a wide range of applications. Its peculiar fitness will be found in the case of subjects who have flabby and mobile and redundant cheeks, and in such persons it meets the indications, even in case the loss of substance has involved two-thirds of the length of the tarsus. A twisted flap taken from the forehead, or from the side of the nose, or from the temple, or a sliding flap pushed horizontally inward from the temple, and perhaps met by another drawn horizontally across the nose, are the types of operation most commonly recommended to meet these cases. The lesions for which relief is sought are usually epithelial growths, and they occupy the lower lid near the inner canthus perhaps more frequently than any other part of the palpebral region. The objection which palpably belongs to every form of twisted flap is the irregularity of its coaptation at the pedicle and the unavoidable deformity. The objection to the sliding flaps with two parallel horizontal incisions is also the conspicuousness of the incisions. The marks left over the malar bone and over the nose are far more noticeable than it is desirable to have them, and they can never be entirely obliterated.

For the operation which I propose, and which I have done a number of times, the advantages are—1st, that the flap cannot slough; 2d, the flap is adequate and in perfect coaptation: 3d, the incisions are so placed as to be inconspicuous. The last characteristic is the argument in favor of this operation which leads me to advocate its general adoption. The use of a naso-buccal flap for

certain special cases of lesion of the upper lids, which I described in the Transactions of the International Congress of Ophthalmology in 1876, led me to the adoption of the kind of operation to be described. The position of the incisions is similar, and what in the present instance I employ as a flap had to be used in the former case, to conceal the deficiency caused by lifting a pediculated flap. One of the incisions is laid perpendicularly downward in the furrow alongside of the nose as far as the ala nasi, and the other one horizontally outward across the temple toward and sometimes reaching the upper border of the insertion of the cartilage of the ear. The details of the proceeding will be given in the narrative of the cases.

CASE I.—Mrs. H. K., married, born in U. S., aged 43, seems to be in good health, is rather stout, admitted to the New York Eye and Ear Infirmary, Oct. 20, 1876. A nodule appeared at the inner angle of right lower lid eighteen years ago; it looked like a scratch which was healing. It never gave pain and never entirely healed. Within five years it has made rapid growth. It is now an ulcerated surface with nodular edges, and of an irregular lozenge shape. Its greater axis is vertical and about 30 mm. long; its width is about 15 mm. The disease involves the skin at the inner canthus and the side of the nose, and extends out along the lid for 15 mm., penetrating deeply into it.

Operation.—The ulcer was dissected out and the inner half of the lower lid was removed, including all its thickness. After this dissection, it was found that epithelial infiltration extended deeply into the orbit at the inner canthus. The diseased substance was scraped out down to the periosteum as far as it could be reached, and the actual cautery then applied. To fill the gap now presented, advantage was taken of the loose, supple, and ample integument of the cheek. From the lowest point of the wound an incision was carried downward and outward two-and-a-half inches to a point half an inch from the angle of the mouth. The finger was kept in the mouth to avoid going through the mucous membrane, and the knife was led along outside the wing of the nose and in the wrinkle which continues toward the angle of the mouth. Another incision was taken from the wound outward, parallel to the edge of the lower lid, on a line about 6 mm. below its border, and continued across the temple toward the top of the ear into the hair; its length was two-and-a-half inches. At the external canthus the fibres of the external canthal ligament were freely divided, that the remaining piece

of the lower lid might more easily be drawn inward. The cheek was then dissected up, beginning at the upper and inner corner of the flap, and was laid down as far as the incisions would permit. This was done by scissors, which had also been used for the horizontal wound, and the cutting was done in the fatty tissue, so as to make the flap rather less than half an inch in thickness. The bleeding was quite copious, but no vessels were tied. The dissection was not interrupted until it was completed, and the flap was then laid over and the bleeding surfaces exposed to the air until hemorrhage ceased. The flap was then dragged upward and inward, and its corner brought to the inner canthus and made fast to the skin of the nose. The perpendicular wound was firmly held together by pin sutures, with interposed thread sutures. Wherever any traction occurred a pin was inserted. The piece of the lower lid was drawn inward, so as to cover two-thirds of the original length, and a small space just inside the inner canthus, running up on the nose where the cautery had been applied, was left to granulate. The angle of the mouth was pulled up slightly by the operation, and the cheek was somewhat flattened. The loss of substance was fully repaired, and the contour of the lids was correct.

Four days after, most of the pins and threads had been removed. The horizontal cut healed by first intention, the vertical one by granulation. No important swelling, no pain, no febrile reaction. On the twelfth day patient was discharged. No ectropium, the mouth not distorted; wounds healed, except a small granulating surface at inner canthus.

The photograph was taken, and exhibits the horizontal cut which is almost effaced and shows no traces of the vertical cut. In 1878 the appearance of the face was so natural and the cuts had so greatly faded that it required close inspection to discover the fact of an operation. The mucous surface of the lower lid was restored, partly by the remaining piece and partly by the transformation which had occurred at the inner corner of the flap. A pseudo-mucous membrane had formed which looked like normal tissue, and the only deficiency was the absence of eyelashes for the inner third of the lid. The caruncle remained and was not sunken, and there was no ectropium and no sign of local return of the disease.

At a later period of the same year, 1878, patient was attacked by cancer of the uterus, from which she died.

CASE II.—Mrs. S. M., born in United States, married, æt. 50, entered the New York Eye and Ear Infirmary Sept. 19, 1878. General

health good, family history has no taints. About twenty years ago noticed a wart-like growth on the right side of the nose near the inner canthus. This increased very slowly, but gave no annoyance, until seven years ago, when an itching in and around the papule caused some discomfort. She consulted me then and I advised its removal, but the advice of other surgeons—to let the tumor alone—was accepted and adopted. During the last year the "lump" has rapidly increased in size, and the edges of the lids in its proximity have begun to ulcerate and discharge.

Patient is in fair health, of small figure and rather thin in flesh. At the right side of the root of the nose, and involving the inner canthus, is a tumor the size of a filbert—round, hard, and rather elastic to the touch. The skin adheres to it, is thin and shows an arborescent arrangement of vessels. The inner third of the upper lid, and the inner two-thirds of the lower lid are ulcerated for some distance from the tarsal edge, and this surface produces a purulent secretion which is not fetid. The integument of the nose and lids, in the vicinity of the tumor, looks red and irritable. The eyeball and ocular conjunctiva are not affected. No glandular enlargement on the face or the neck. Vision O. D. $= \frac{20}{200}$ being reduced by an old opacity of the cornea v. O. S. $= \frac{20}{20}$.

Sept. 20.—Patient was etherized, and the ulcerated portion of the lids and the mass were removed as thoroughly as possible with scissors. Disease did not seem to extend very deeply into the orbit, lachrymal sac was not seen. Actual cautery was used to stop bleeding in the orbit next to the nose. The orbital fat was exposed in the operation. The incision was then extended from the wound straight down, beside the nose to the ala, and along the lid, parallel to its edge, in a horizontal line, straight outward and backward to the ear. The whole flap, circumscribed by these incisions, was dissected up carefully by scissors, an opening into the mouth being avoided by the introduction of one finger into the mouth, and it was carried upward and inward to be stitched to the integument at the side of the nose on a level with the lower lid. A relief cut was found necessary at the lower end of the flap, near the ala nasi, to adjust the flap exactly, without raising the angle of the mouth.

After this flap had been united by lines of suture to the conjunctiva of the lower lid, and along its horizontal and vertical edges, there remained still a gap including about one-third of the upper lid and a portion of the root of the nose to be filled up, and this was done by a flap about the size of a silver half-dollar, taken from the arm,

after the method of Mr. Wolf. The subcutaneous connective tissue having been dissected off, the flap was very ample ; and when put in position it was found that the levator muscle, which had been left, could move it readily with the remaining portion of lid.

Sept. 21.—Warm compresses to flap, which looks white.

Sept. 22.—Warmth continued, flap looks well. Incisions on side of nose and temple healed per primam. Patient, who felt well yesterday, has great nausea to-day ; controlled by hypodermic use of morphia.

Sept. 23.—Sutures removed to-day. Patient feels well. Flap looks well at nasal side, where, with strong lens, a vascularized area of about 1''' in width can be seen in the new flap, the epithelium on the remainder looks raised and œdematous.

Sept. 24.—Patient felt chilly this A.M., and nausea has returned. Temp. 101°, pulse 108. Flap looks whitish and sloughy. Epithelium on it is raised in vesicles and can be pealed off.

Sept. 25.—Feels well to-day. Flap is sloughing.

Sept. 26.—Nausea and fever again to-day. ℞. Quin. sulph., gr. ij., q. 1 hor.

Oct. 1.—Flap has come away completely. Nausea and fever subsided. Quinine has been kept up steadily as above. She now takes gr. iij., q. 1 hor.

Oct. 10.—Has been gradually gaining strength. Healthy-looking granulations on all raw surfaces. Patient felt chilly this morning and has some elevation of temperature and redness of the cheek (flap) over the place of dissection. ℞. Tr. ferri chlor., gtt. x., q. hor. Lotio plumbi locally.

Oct. 11.—Patient felt better to day, was etherized this P. M., the edges of the wound were freshened, and a flap taken from the adjacent portion of the nose was slid into the vacancy left by the sloughing of the transported one. To this end two parallel, horizontal incisions were carried across the root of the nose, nearly to the left inner canthus, and the portion of integument lying between them was raised and slid to meet the deficiency. To facilitate this the integument of the left lid and both brows were extensively undermined, and relief cuts were carried to the brow and left lid in order to bring both brows and lids on a proper level. This flap, when adjusted, accomplished its object completely.

Oct. 13.—Stitches removed to-day. Great swelling of tissues around the wound, with redness and pain. Temperature 101½°, pulse 112. ℞. Tr. ferri chlor., gtt. x., q. 2 hor. Lotio plumbi et opii.

Oct. 15.—Lines of suture show ulceration of integumental border. Considerable discharge of sero-purulent fluid.

Oct. 20.—Compresses of lint and plaster put over flap to coapt lines.

Oct. 22.—Doing well. Compresses continued.

Nov. 1.—Wounds are all healed and edges united. Discharged to-day.

Dec. 20.—Returns to-day. Showing the flap at the inner canthus contracted so as to narrow the palpebral fissure and present an elevation at inner canthus. Cantholysis done at the outer angle for this, and a fusiform piece of the thickened flap was excised, and the edges of this incision brought together so as to flatten it. This accomplished the desired result. Discharged, *cured*, Jan. 7, 1879.

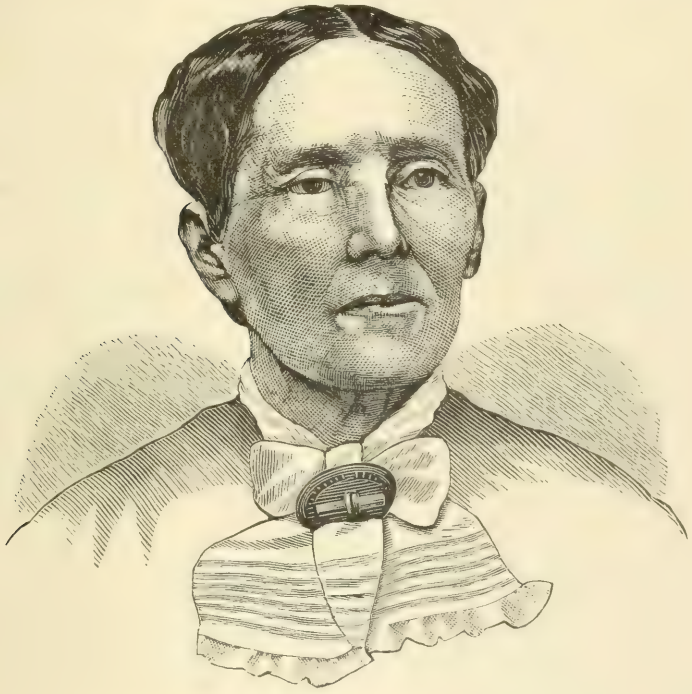
A photograph was taken on Nov. 18th, and shows the swollen flap from the root of the nose, and also how much the palpebral fissure was narrowed. The lines of the incisions along the nose and on the temple can be traced. The patient was seen again in July, 1879, and a small mass of simple granulation tissue removed from the inner canthus. The appearance of the face is extremely natural, and she has perfect command of the eyelids. Another photograph was obtained in Oct., 1879, of which the figure on the opposite page is a copy. The parts look natural, the lids open sufficiently, and there is no pain.

I add to the above cases another, which illustrates an unusual kind of deformity of the eyelids, and a proceeding which can be used when the supply of skin for transplantation is scanty.

CASE III.—W. M., aged 18, born in United States, was admitted to the New York Eye and Ear Infirmary on Nov. 7, 1878. General health good, with the exception of having had intermittent fever. Within six months he had facial erysipelas, which caused an abscess on the cheek, followed by extensive sloughing. The cicatricial contraction has produced complete ectropium of the lower lid, and has, in addition, dragged down the skin about the inner canthus, together with the upper lid, so as to completely cover the eye and render it useless. Patient is obliged to wear a bandage to protect the everted eyelid from irritation.

Operation.—Patient was etherized, and an incision made parallel to the lower lid and half an inch below its edge, dissecting up the tissues freely until the lid could be completely restored to proper position. All of the nodular cicatricial tissue was then excised. Next the inner canthus was cut loose to free the upper lid. Across

the root of the nose the parallel incisions were carried horizontally, and the flap thus marked out, and which was about half an inch in width, was freely undermined toward the upper lid of the opposite eye, especially under the brow, and made to meet the loosened upper lid of the right eye, to which it was stitched fast. Both upper eyelids were thus brought to the same level. A large gap below the lower lid now remained to be filled. To aid in this result an incision was carried vertically down alongside of the nose to its ala,



and the adjacent skin undermined, so as to loosen and lift up the cheek. The space to be filled was too large, and the tissues too firm and tight to close the gap by sliding the cheek. It was necessary to take a flap from the temple, which was done by extending the incisions in a proper manner until a flap, one inch and a quarter wide and two and a quarter inches long, was obtained, and when turned horizontally was found to fit the vacancy perfectly. To avoid needless twisting of the pedicle, the most external vertical cut was carried well down in front of the ear. The apex of the flap being

stitched into position at the inner canthus, it remained to cover the large lack of substance on the temple. The skin of the vicinity was too firm to permit any approximation of the edges, even after extensive undermining. A horizontal incision was made above the ear, and from its posterior extremity another cut was carried up vertically, until a sufficiently large flap of the hairy scalp had been obtained to fill the hiatus. This was slidden forward on its base, which was above, and properly secured. The line of hair was thus brought to within a quarter of an inch of the outer end of the eyebrow, and all wounds about the lids, cheek, and temple were in perfect coaptation without undue tension. A small triangular space in the scalp, just behind the tip of the ear, was left to be filled by granulation.

This compensatory flap from the scalp, to take the place of one removed from the temple, is a device to which I have had recourse on occasion during a number of years. It is applicable when a large amount of tissue has to be removed from the temple, and the adjacent parts cannot be slidden enough to cover. A granulating surface on the temple leaves a large and ugly scar, while a cicatrix on the scalp is of no consequence. The primary flap has its pedicle below, the secondary or compensatory one has its pedicle above. Both are nearly of the same form and size, although the incisions will be directed so as to secure the best adjustments. The scalp is so mobile that the vacancy to be left will become a very small triangle.

In closing up the wounds fifty-five sutures of fine black silk, and seven hare-lip (fine insect) pins were used. The operation occupied two and a half hours. Much blood was lost. Several arterial twigs were encountered and were either twisted or checked by pressure; none were tied.

Patient was distressed by nausea and great thirst all the evening. Milk and whiskey were given freely. On trying to rise during the night he fell back faint against the wall. Morphiæ sulph., gr. $\frac{2}{3}$, produced sound sleep.

Nov. 9.—Feels well. Lines of suture look well. A pressure-bandage kept upon the flaps to promote absorption of a large thrombus.

Nov. 10.—All the thread sutures taken out; pins left; pressure continued.

Nov. 14.—Last pin taken out. The lines of incision measure nineteen and a half inches in the aggregate. Since the 12th, patient has been sitting up.

Nov. 22.—Was discharged, granulating surface nearly healed.

Jan. 31, 1879.—Returned to-day. Has good use of his eye. The palpebral opening on the same level as the other eye, but it does not expand to proper width, and the skin at the inner angle comes down in a vertical fold, like an extreme degree of epicanthus, and covers up the caruncle. It reaches out over one-third of the palpebral opening. This is the result of the contraction of the flaps and adhesion of the skin to deeper parts. Patient not in very good condition; has had fever and ague, and looks thin. It was thought proper to attempt to correct the partial closure of the lids.

Patient was etherized. A horizontal incision was made through the middle of the vertical fold of skin, and it was found that the natural contour of the inner canthus was not disturbed. The surrounding skin was undermined above and below with scissors. A flap was taken from the root of the nose, having its free end above on the median line and its base below, and the latter was loosened and extended by incisions running down on each side of the median line of the nose until it had a length of one inch and a half, and its breadth was half an inch. The tip of the flap was split down its middle for about half an inch, and the subcutaneous tissue trimmed off to reduce its thickness at its extremity. The bifurcated end was now adjusted to the inner canthus and held in place by stitches. The gap at the forehead (glabella) was covered by drawing together the skin and holding it by pins. A small triangular vacancy, below the inner border of the lower lid, was filled by sliding inward a quadrangular flap whose base was below. This bit of skin came to grief because it was the tip of that flap removed from the temple, and was located upon the spot where the original cicatrization existed. To support the parts, the cheek was drawn toward the inner canthus by means of a quill suture, whose extremities were one inch and a half from each other. One was on the cheek, the other on the nose near the canthus of the opposite eye. The thread was carried beneath the intervening flaps. All the parts were accurately fitted without tension, both by the above-described quill suture and by numerous fine interrupted sutures. (See diagram.)

Feb. 15.—The lines of junction on the forehead and at inner canthus united by first intention. The flap turned in from the cheek, and which was held *in situ* by the quill suture, has mostly sloughed, and granulations are springing up. Discharged.

July 22.—Came to the infirmary to-day. Is able to open the eye widely. A slight ectropium of the lower lid exists, but is not annoying, while the appearance of the parts is satisfactory.

A DESCRIPTION OF A MODIFICATION OF FÖRSTER'S PERIMETER. By Dr. W. H. Carmalt, of New Haven, Connecticut.

The apparatus to which I beg leave to call the attention of the Society is simply a modification of Förster's well-known perimeter, rendered accessible to American practitioners, and freed from certain accessories which both increase the cost of that instrument and complicate its working, but which can, I think, be so changed or entirely done away with as not to lessen its value.

It is represented in a front view by Fig. 1, and consists, in the main, of a brass arc, B, revolving smoothly around an axis, c, the latter sliding up and down on the rod, A.

The arc is cast accurately on a uniform curve of 35.5 centimetres radius; it embraces in its length about 140° of a circle, and is in two parts. The main central portion includes about 100°, the axis, c, being at the middle of this; the additional piece, to make up the remaining 40°, is arranged to fit to either end of the main part, making whichever arm it is attached to 90° from the axis. The arc is about 65 millimetres broad, and of sufficient thickness to be firm and preserve its curve; being cast is an additional security to the same end. The face is blackened, and a white line drawn through the middle along its whole length. It is also divided by similar white lines, at right angles to this line, into spaces of 10°, each numbered respectively up to 50°, on the main piece of the arc, and continued on to 90° on the additional piece.

The axis, c, extends backward about 70 mm., and near the farther end has a hole through which the rod, A, passes perpendicularly. A thumb screw at the extreme end serves to fasten the axis, and with it the arc at any height upon the rod. This rod is of highly polished steel, nickel-plated, 9 mm. in diameter and 48 cm. in length; it is screwed firmly at its lower end into the heavy brass clamp, E, which may be fastened to the edge of a table, mantel-shelf, bracket, or other convenient support, by means of a heavy thumb-screw, with a revolving washer at the top, allowing a firm grasp without tearing or fraying the underside of whatever woodwork it may be attached to.

Upon the front of the clamp E, by a half bayonet fastening, so that it may be unshipped and laid aside when not in use, is attached the arm, D, carrying at its other end the crutch-piece, C, intended to support the chin of the patient. The arm proper is about 30 cm. long, of square tubing, and receives into its open end another sliding piece, allowing the whole to be lengthened to 35.5 cm., mentioned as the radius of the arc B, and the proper distance for the eye to be from the point of fixation, C. Another piece of square

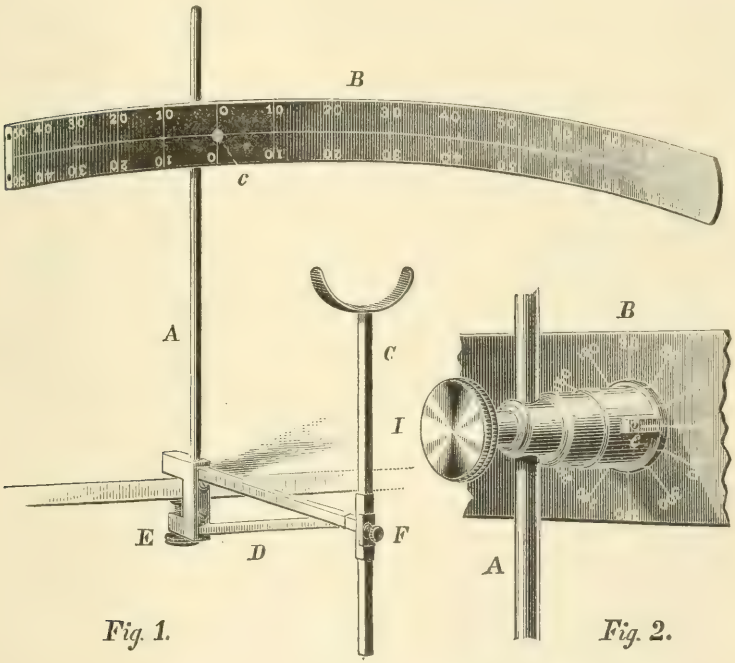


Fig. 1. *Fig. 2.*

tubing is fastened at right angles and perpendicularly to this piece, in which slides the square nickel-plated rod, C, carrying upon its upper end a curved piece of smooth nickel-plated brass, upon which the chin rests. This rod may be fastened at any height upon the arm, D, by a small thumb-screw, F, so that the height of the crutch and the arc B may be made to correspond respectively to the heights of the chin and the eye of the patient.

Fig. 2 shows the reverse side of the arc B, the prolongation of the axis backward, the rod, A, upon which it slides, and the thumb-screw fastening. On the left-hand side of the axis as the patient

sits facing it, directly on the horizontal line, is an index, c, pointing to radiating lines on the reverse surface of the arc. These radii are drawn around the axis in spaces of 30°, numbered as the opticians now reckon, the axes of cylindrical lenses (as the Society has this year given its approval) at zero for the left horizontal line, and running upward and around to 360°.

It would be quite out of place here to urge the importance of accurately recording the visual field when possible; in order to facilitate this, I have persuaded the maker of the perimeter to publish a chart to send with it. This chart is on a somewhat larger scale than any heretofore published, the scale being exactly *one* millimetre for each degree of the circle comprising the diagrammatic visual field. The centre of the field corresponds to the macula lutea, the chart is then spaced off—1st, by concentric circles, each 10° or 10 mm. apart (and the actual distance from the macula of a defect or lesion in the eye when it gives a break in the field of vision may, in some cases, be calculated); and 2d, by radii drawn at every 30° of the visual circle, intersecting the above concentric circles and numbered to correspond with the radii on the reverse side of the arc. The blind spot is noted at about 15° external to the centre of the chart. The clear space on the chart is an approximation only to the normal visual field; the variations at the periphery being so dependent upon individual conformations of face, prominence of eye, etc., that a standard scheme would, of course, be useless. This has been constructed as an average, from the observations of Förster, Aubert, Schoen, Hirschberg, etc., and it was thought desirable to indicate nearly the usual field, so that a striking variation would be detected at a glance. I have had it printed upon thin paper, for insertion in the book of histories which every one keeps.

The object of fixation (as stated, the proximal extremity of the axis) is an unpolished disk of nickel-plated brass, 15 mm. in diameter. I use, for the second or movable object, squares of thick cardboard, capable of being inserted in a little spring clasp at the end of a stick serving as a handle. This handle is 35.5 cm. long, and may be used to determine with sufficient accuracy the position of the patient's head, or rather eye, at the centre of the curve of the arc, by measuring the length of the handle from two points (say zero and 90°) on the arc; where these intersect on the horizontal plane is the centre of the circle, and there the eye should be placed. The chin then resting upon the crutch is steady enough for practical purposes.

The instrument as described is made by Mr. Paul Roessler, an

optician in New Haven, price $20. A number of little card-board "objectives" respectively 10 and 5 mm. square, each in white, yellow, blue, red, and green, go with it. He also furnishes the above-mentioned charts at $3 per hundred.

STATISTICS OF EXTRACTIONS OF CATARACT BY THE FLAP OPERATION AND BY v. GRAEFE'S METHOD.

By Henry D. Noyes, M.D., New York.

The following tables have been prepared, not with the view especially of instituting a comparison between the old flap operation and the modern v. Graefe's method, but with the view of attempting to arrive at a just estimate of each by itself. As to the flap extraction, I have discovered some errors in the table collated by Dantone, "Beiträge zur Extraction des grauen Staars," Erlangen, 1869, in his paper. Certain cases by Sichel having been omitted, and the number credited to Roux not being correct, I therefore thought best to repeat the table, giving the authorities, that it might serve for future reference.

Regarding v. Graefe's method, no effort has been made to separate the innumerable subdivisions of this operation from each other; whether the wound be at a greater or less distance from the limbus, or be more or less of a flap. It is not asserted that these differences may not have influence, or that some other details may not be potential, but the purpose has been to gather into a mass all the reported cases, that the aggregate may be large enough to justify some general deduction as to the value of the operation in its percentage of failures. It is not claimed that 11,000 cases are enough to warrant a precise numerical statement of percentage, but it is all that we can now command, and the figures may be utilized in future.

I present the tables without, at the present time, attempting to make any deductions or comments.

TABLE OF FLAP EXTRACTIONS.

OPERATOR.	CASES.	LOSS. Per cent.	REFERENCES.
Daviel	207	11.70	J. C. Hellmann: Der Graue Staar und dessen Herausnehme. Magdeburg, 1777.
Daviel	34	26.40	
La Faye	6	33.30	
Poyet	7	28.40	
Sharp	19	50.00	Mackenzie: Treatise on the Eye. Am. Edition, 1855, p. 710.
Tartera	33	24.20	
Roux	306	38.56	
Hellman	50	16.00	
Jung	237	14.30	J. H. Jung: Methode der Grauen Staar Auszuziehen. Marburg, 1792.
Richter	10	30.00	Himly.
Rosas	42	7.20	Seeliger. Wien, 1828.
Rosas	39	12.00	Schmidt Jahrbücher.
Sichel	780	11.92	Annales d'Oculistique. T. 34, p. 175.
Werner	26	12.00	Schmidt Jahrbücher.
Fred. Jaeger	728	4.50	Ed. Jaeger: Ueber Grauen Starr. Wien, 1844.
Ed. Jaeger	114	7.50	Ed. Jaeger: Ueber Staar u. St. Oper. Wien, 1854.
Arlt	1,494	7.78	Graefe und Saemisch: Handbuch, B. III., 1, 318.
Rivau-Landrau	2,073	10.00	Annales d'Oculist., T. 47, p. 65.
Pagenstecher	127	11.10	Jahresberichte, 1859, 1861, 1862.
Stöber	30	20.00	Jahresberichte, 1856 u. 1858.
Küchler	22	5.00	Deutsche Klinik.
Heymann	30	10.00	Prager Vierteljahrschrift, B. II, 1860.
Ruete	108	9.30	Programm, etc. Leipzig, 1867.
Mooren	97	11.00	Verminderte Gefahren, etc. Berlin, 1862.
Mooren	59	3.40	
Rosander	168	34.50	Zehender Monatsblätter, 1864.
Rosander	7	14.20	
Steffan	16	18.70	Jahresberichte, 1865 u. 1866.
Knapp	79	13.90	" 1864 u. 1865.
von Graefe	1,600	7.00	Archiv f. Ophth., Bd. XI., Abth. 3.
von Graefe	900	5.00	
Gioppi	194	13.90	Gioppi. Resoconto. Padova, 1858.
Quaglino	21	28.50	Giornale d'Oftal. Torino, 1868.
Magni	35	28.50	Il tempo, 1858.
Rothmund	396	12.20	Bericht, 1868.
35 items	10,094	$\frac{591.96}{35}$ = 16.91 per cent. loss.	

If in the above table we leave out all the items in which there are less than 50 operations, let us see how the result will be affected, as in the following table:

FLAP EXTRACTIONS.

OPERATOR.	CASES.	LOSS.
		Per cent.
Daviel	207	11.70
Roux	306	38.56
Hellman	50	16.00
Jung	237	14.30
Sichel	780	11.92
Fred. Jaeger	728	4.50
Ed. Jaeger	114	7.50
Arlt	1,494	7.78
Rivau-Landrau	2,073	10.00
Pagenstecher	127	11.10
Ruete	108	9.30
Mooren	97	11.00
Mooren	59	3.40
Rosander	168	34.50
Knapp	79	13.90
v. Graefe	1,600	7.00
v. Graefe	900	5.00
Gioppi	194	13.90
Rothmund	396	12.20
19 items	9,717	$\frac{243.56}{19} = 18.08$ per cent.

The difference obtained by excluding the small amounts, it will be seen, is only trifling, and accrues adversely to the general result.

We now present a table of operations by Graefe's method :

Table of Graefe's Operations.

Operator.	Year.	Cases.	Loss in per cent.	References.
Graefe	1865–6	369	3.3	Archiv für Ophthal., Vol. XI. and XII.
Knapp	1867	100	2.	Archiv für Ophthal., Vol. XIII.
Knapp	1868	100	2.	" " Vol. XIV.
Meyer	1867	67	3.)	Klinische Monatsblätter für 1867,
Höring	1867	77	6.4)	page 279.
Heymann	1867	40	5.	Ophthal. Bericht, 1868.
Wecker	1868	50	5.	Des nouveaux procédés, etc. Paris, 1868.
Rothmund	1868	186	3.8	Dantone: Beiträge, etc. Erlangen, 1869.
Critchett	1868	100	5.	Congrès périodique d'Ophthal. Paris, 1868.
Wecker	1869	109	4.8	Nagel: Jahresbericht, 1872, p. 195.
Coccius	1869	62	6.45	" " " p. 194.
Martin	1869	55	3.64	" " " p. 396.
Knapp	1869?	100	3.	Archives of Ophth. and Otology, 1869, p. 130.
Rothmund	1869–70	180	1.7	Nagel: Jahresbericht, 1874, p. 398.
v. Oettingen	1869	91	4.	" " 1873, p. 362.
Secondi	1869	120	8.33	" " " "
Horner	1867–70	371	5.4	" " 1874, p. 189.
Quaglino	1868	21	28.6	Steffan: Erfahrungen, etc., 1869. p. 14.
Snellen	1871	209	2.5	Werthoff. Utrecht, 1871.
Derby, H.	1871	60	5.	Nagel: Jahresbericht, 1873, p. 363.
Holmes	1871	46	13.	" " " "
Wilson	1871	100	5.	" " " p. 364.
Wecker	1871	95	3.15	" " 1874, p. 187.
Cohn	1871	29	6.9	" " " p. 186.
Engelhardt	1871	15	6.6	" " " "
Evers	1871	79	3.3	" " " "
Jany	1871	31	19 3	" " " "
Just	1871	39	5.1	" " " "
Rothmund	1871	99	4.	" " " "
Schmitz	1871	20	0.	" " " "
Stör	1871	17	5.9	" " " "
Sternheim	1871	38	8.1	" " " "
Brockman	1871	22	9.	" " 1873, p. 363.
Keller	1871	20	11.	" " " p. 364.
Schiess-Gemuseus	1867-72	100	20.	" " 1874, p. 188.
Sichel	1871–72	123	2.4	" " 1875, p. 172.
Little	1872	200	3.5	" " " p. 168.
Gayat	1872	216	4.62	" " " p. 479.
Wecker	1872	217	3.22	Clinique Ophth.: Martin. Paris, 1873.
Barde	1869–72	43	6.98	Comptes rendus, 1873.
Rothmund	1872	153	4.	Nagel: Jahresbericht, 1875, p. 144.
Hirschberg	1871–72	70	2.86	Klinische Beobachtungen, 1874, p. 38.
Maconochie	1873	50	0.	Nagel: Jahresbericht, 1876, p. 481.
Coppez	1873	66	3.	" " " p. 484.

TABLE OF GRAEFE'S OPERATIONS— *Continued.*

OPERATOR.	YEAR.	CASES.	LOSS IN PER CENT.	REFERENCES.
Wecker	1873	250	1.6	Clinique Ophth. : Masselon. Paris, 1874.
Mooren	1866–73	1,500	6.25	Ophthal. Mittheilungen, Berlin, 1874.
Arlt	1866–73	1,075	5.67	Graefe and Saemisch : Handbuch, Bd. III., Th. 1, 318.
Rothmund	1873	116	3.44	Nagel : Jahresbericht, 1875, pp. 150 and 156.
Knapp	1873	100	9.	Transactions Amer. Ophth. Soc., 1873, p. 50.
Fieuzal	1874	51	0.	Clinique, Comptes rendus. Paris, 1876, p. 105.
Wecker	1874	179	1.7	Clinique Ophth. : Masselon. Paris, 1875.
Agnew	1874	85	8.23	Trans. Amer. Ophth. Soc., 1874, p. 251.
Calhoun	1874	15	0.	Atlanta Med. and Surg. Journal, 1874.
Vidor	1874	40	10.	Nagel : Jahresbericht, 1876, p. 479.
Braun	1874	145	5.	" " " p. 179.
Hirschman	1874	81	5.	" " " "
Just	1874	74	9.	" " " "
Schöler	1874	49	6.	" " " "
Rydel	1874	43	7.	" " " "
Pagenstecher	1874	42	12.	" " " "
Woinow	1874	40	15.	" " " "
Derby	1874	36	22.	" " " "
Waldhauer	1874	34	9.	" " " "
Hirschberg	1874	29	7.	" " " "
Baürlein	1874	29	7.	" " " "
Brettauer	1874	26	7.	" " " "
v. Höring	1874	24	16.	" " " "
Dürr	1874	20	5.	" " " "
Krüger	1874	18	6.	" " " "
Hirschman	1874	15	0.	" " " "
Cohn	1874	13	0	" " " "
Casper	1874	12	0.	" " " "
Emmert	1874	4	0.	" " " "
v. Reuss	1874	3	0.	" " " "
Schmitz	1874	2	0.	" " " "
Jeffries	1874–5	88	8.	Boston Medical and Surg. Jour., Oct. 1, 1874, Nov. 4, 1875.
Swanzey	1874	21	14.	Report National Eye and Ear Infirmary. Dublin, 1876.
Wecker	1875	48	4.1	Clinique Ophthal. : Masselon. Paris, 1876.
Blessig	1875	372	11.	Nagel : Jahresbericht, 1877, p. 158.
Schiess-Gemuseus.	1875	100	8.	Graefe's Archiv f. Ophth., Vol. XXI., Abth. 1, p. 153.
Schiess-Gemuseus.	1875	100	11.	Graefe's Archiv f. Ophth., Vol. XXI., Abth. 1, p. 153.
Strawbridge	1875	27	0.	Nagel : Jahresbericht, 1877, p. 157.
Hirschman	1875	98	5.	" " " p. 153.
Rothmund	1875	93	12.	" " " "

TABLE OF GRAEFE'S OPERATIONS—*Continued.*

OPERATOR.	YEAR.	CASES.	LOSS IN PER CENT.	REFERENCES.
Secondi	1875	90	4.	Nagel: Jahresbericht, 1877, p. 153.
Just	1875	58	9.	" " " "
Rydel	1875	47	4.	" " " "
Brettauer	1875	38	5.	" " " "
Waldhauer	1875	37	27.	" " " "
Hirschberg	1875	36	6.	" " " "
Michel	1875	34	3.	" " " "
Bauerlein	1875	31	0.	" " " "
Reymond	1875	30	10.	" " " "
Derby	1875	29	7.	" " " "
Hirschman	1875	27	4.	" " " "
Schöler	1875	26	4.	" " " "
Swanzey	1875	26	12.	" " " "
Bonwetsch	1875	22	0.	" " " "
Barde	1875	19	21.	" " " "
Ponti	1875	17	18.	" " " "
v. Höring	1875	16	12.	" " " "
Schneller	1875	9	11.	" " " "
v. Becker	1875	9	0.	" " " "
Gulstad	1875	9	0.	" " " "
Hjort	1875	3	33.	" " " "
Hirschberg	1876	20	0.	Beiträge zür prak. Augenh. Leipzig, 1877.
Wecker	1876	109	0.	Clinique Ophthal.: Masselon. Paris, 1877.
Keyser	1870–77	167	4.	Trans. Med. Soc. State Penn., 1875. Separate print.
Engelhardt	1877	100	3.	Centralblatt f. Augenheil. Leipzig, 1877, p. 215.
Knapp	1877	200	14.	Paper read before N. Y. Academy of Medicine, 1877.
110 items		10,661	$\frac{717.84}{110} = 6.52$ per cent. loss.	

If we select out of the list the items furnished by the six operators who have done the greatest number of operations, we have a more favorable showing in the result. Instead of a loss of 6.5 per cent., we have a loss of 4.5.

The table is as follows:

LARGE SERIES OF LINEAR EXTRACTIONS.

OPERATOR.	YEAR.	CASES.	LOSS PER CENT.	LOSS PER CENT.
Graefe		600	2.8	2.8
Mooren	1866 to 1873	1,500	6. to 6.5	6.26
Arlt	1866 to 1873	1,075	5.67	5.67
Wecker	1868	50	5.	
	1869	109	4.8	
	1871	95	3.15	
	1872	217	3.22	
	1873	250	1.6	
	1874	179	1.7	
	1875	48	4.1	
	1876	109	0.	3.
		1,057		
Rothmund	1868	186	3.8	
	1869-70	180	1.7	
	1871	99	4.	
	1872	153	4.	
	1873	116	3.44	3.4
		734		
Knapp	1867	100	2.	
	1868	100	2.	
	1869	100	3.	
	1873	100	9.	
	1877	200	14.	6.
		600		$\frac{27.12}{6} =$
Total		5,566		4.52

It will be seen that among these operators the results at different periods were by no means uniform. Thus Wecker varies between 0. per cent. and 5. per cent; Rothmund between 1.7 per cent. and 4. per cent., and Knapp between 2 per cent. and 14 per cent. Of all operators Mooren furnishes the greatest number, viz., 1,500 cases, and his loss is between 6 per cent. and 6.5 per cent.

When conclusions can be drawn from series so large at the hands of the same operator, it seems fair to infer that any better results are only to be expected from improvements in the method, and not from improvement in the skill of the operator.

So far as we are now authorized to say, we may regard an average loss of 6 per cent. as what is to be expected in Graefe's mode of extracting cataract, when done in the most skilful manner.

A CASE OF INTRA-ORBITAL TUMOR OF RAPID GROWTH, WHICH RESULTED IN DEATH. By J. F. Noyes, M.D., Detroit, Michigan.

Early in December last, a smart, healthy-looking lad, aged seven years, the son of Mr. G——, Defiance, Ohio, while going to school, was hit by a foot-ball in his left eye. Not minding it, he continued going to school for a week, when the eye began to be painful, look red, and the parts around it to swell up. With this there was lachrymation. The case grew rapidly worse. About two weeks after the accident the father brought him to me for consultation.

Status præsens.—The lids and surroundings of the eye discolored; globe protruding and immovable; nearly all of the cornea leucomatous; the injected conjunctival sac bulging out all around the eye-ball, widely and fixedly separating the lids, and presenting a very red and glistening appearance.

The eye was enucleated Dec. 9th. Its external appearance, save the cornea, was entirely normal. A section in its horizontal meridian revealed the retina everywhere adapted to the fundus of the eye; the vitreous disorganized and fluid; the lens cataractous. Nothing further was noticed abnormal in the interior of the eye. After the eye had been removed the father would permit nothing more to be done. Having expressed to him my fears of the malignancy of the affection, in a few days he took the boy home and placed him under the judicious care of his physician, Dr. Moss. Little or no treatment was made use of, other than what was necessary to keep him comfortable while he lived. The tumefaction in the orbit increased rapidly, and, *pari passu*, the patient failed in strength and suffered very much. Death came to his relief at the end of four months from the date of the accident. The tumor then extended to a point even with the chin, and presented externally a nearly smooth, even surface. It was immediately removed and placed in alcohol. The doctor very kindly forwarded it to me for dissection and microscopical examination, and informed me that when removed its weight was one and three-quarter pounds and its "density but little greater than water." It was found that the tumor had extended into the antrum and crowded down the

roof of the mouth, loosened up the malar bone and bridge of the nose, and pressed it over to the opposite side. No photographic view was permitted, either before or after death, though earnestly desired. Numerous sections were made of the tumor by Dr. Robertson, and carefully examined under the microscope, and found to consist of numerous round cells embedded in a scanty and unusually soft, fragile, fibrous, or soft, fine, homogeneous, granular, intercellular substance. There appeared no doubt, therefore, of the tumor being a *round-celled* sarcoma, which always extends rapidly by peripheral growth, as in this case, infiltrating and involving the surrounding structures, and exceedingly vascular.

FOREIGN BODY IN THE POSTERIOR POLE OF LENS—PURULENT CYCLITIS.

By Thomas R. Pooley, M.D., New York.

W. Ellis, æt. 28, by trade a gardener, consulted me Dec. 6, 1878. One month before, while attempting to remove the hoop from a barrel by striking upon a chisel which had been inserted under it, a piece of steel flew into the right eye. When the eye was struck he experienced a sensation of light flashing before it, and some pain; but there had been no difficulty in seeing until about ten days previous. Upon examination of the eye, the following notes were taken: No circumcorneal injection; S. $= \frac{1}{200}$; F. limited somewhat below; no pain on pressure, but he says the eye aches all the while; L. E., Em. S. $\frac{2}{20}$, A. $= \frac{1}{5}$. Oblique illumination shows a small linear-shaped scar in the cornea at its upper inner part, as well as in the anterior capsule of the lens.

Lying in the posterior pole of the lens, to the outer somewhat upper part, a small foreign body of a blackish color could be distinctly seen; lens somewhat cataractous, the opacity extending mostly from the rent in the anterior capsule to the foreign body; in left eye nothing abnormal seen. In consultation with Dr. Knapp, we decided to wait for the maturation of the cataract, and then to remove the lens, and, if possible, the foreign body with it. The cataract progressed slowly, until the lens was so far opaque that the foreign body could no longer be seen; but during all this time, with the exception of the aching already mentioned, the eye

was free from irritation or inflammatory symptoms, and not painful to the touch. On the 30th of Jan., 1879, however, he came, saying that the eye had been feeling more painful for the past few days, and that the night before the pain had become so intense that he could not sleep.

There was now circumcorneal injection, great pain, contracted pupil, anterior chamber deep, iris retracted. The eye was very tender to the slightest touch, upper inner quadrant of F. wanting. Enucleation was proposed and performed the same afternoon. There was no reaction following the operation, and the patient was discharged a few days after the operation.

The eye was opened immediately after enucleation by an equatorial section. Vitreous was clear, with the exception of about six whitish streaks, extending from the lens backward. There was an opening in the posterior lens-capsule of about half its diameter, from which the swollen lens matter was protruding, small flakes being detached and suspended in the vitreous, just as we see it often in the anterior chamber in traumatic cataract. The outer segment of the ruptured capsule forms a flap projecting backward and alongside of it; outside of the capsule lies the foreign body, a small 2 mm. long piece of steel. The foreign body was lifted up with iris-forceps, and when replaced was lying upon the outer half of lens; steel surrounded by a small abscess (from ciliary body); purulent infiltration of the vitreous, especially near the foreign body, the white streaks radiating from there backward.

In thinking over the case, it seems to me most probable that one end of the foreign body had perforated the posterior capsule, the other remaining in the lens, and so long as these relations remained, it was a harmless resident. But it finally passed through the lens and fell down on the ciliary processes, where it was found. This presumption is rendered very much more plausible by the fact that a day or two before the severe pain set in he spent the afternoon removing some barrels of apples into a cellar, and while lifting a heavy weight he may have entirely dislodged the foreign body from the lens.

But to me the most interesting and instructive lesson to be learned from the case is in regard to the treatment. In cases where the body has, as in this instance, perforated the cornea and lens, and lay in the posterior cortical substance below the nucleus, two methods may be made use of for its extraction, as recommended by Hulke and von Graefe, referred to by Knapp in his article on the Removal

of Foreign Bodies from the Interior of the Eye: Archives, Vol. VIII., p. 321. In Hulke's case a splinter of iron had penetrated the periphery of the cornea and iris, and laid in the posterior cortical substance below the nucleus. Hulke introduced a cataract-needle through the cornea and lens behind the foreign body, and pushed the same into the anterior cortical substance. Then he made a corneal section, removed first the foreign body with a curette, and then the cataract; recovery without irritation; vision good. In v. Graefe's case, a splinter of metal about $\frac{2}{3}'''$ in length lodged in the posterior cortex, opposite the outer edge of the dilated pupil. The accident had occurred about ten days previously. A small corneal scar and a small rupture of the lens-capsule were present. V. Graefe dilated the rupture with the needle. The lens swelled, the foreign body gradually moved forward, and, surrounded by lens matter, projected into the anterior chamber three weeks later. Lest it should fall to the bottom of the chamber or adhere to the iris, Graefe made a linear section, passing the knife behind the protruding lens substance. The foreign body and the protruding portion of the cataract came out as soon as the knife was withdrawn, and the remainder of the lens was then expelled in the usual manner; one and a half weeks later, perfect recovery. Dr. Knapp and I discussed these two methods of procedure, with which he was quite familiar at the time, as he was just then writing his paper; but we determined upon the course which was pursued. It now seems to me, that, if one or the other methods referred to by Hulke or v. Graefe had been resorted to, the eye might have been saved.

HYPEROSTOSIS AND PERIOSTOSIS OF THE BONES OF THE ORBIT. ILLUSTRATED BY TWO CASES. By Dr. Charles S. Bull, of New York.

Hyperostosis and periostosis are two distinct pathological processes in bone, though they may, and very often do, coexist. Especially is this the case in the bones of the skull and face. The one process, hyperostosis, is sufficiently rare in the region of the orbit, for, out of a total of over 16,000 cases seen by the writer, it has only been observed in two cases. The excessive development of one or more of the bones which enter into the formation of the orbit would, of course, produce the most singular changes in the shape of this cavity. Of late years we have gained a more correct idea of the nature of the processes which occur in diseased bone, and of the differences which exist between a morbid process starting from the periosteum and one originating in the bone-tissue proper. Wagner defines hyperostosis as "an increase in the diameter of the bone, occurring in the whole bone or in a part of it." It may affect only the external compact tissue, or the medullary substance alone, or may be met with in both at the same time.

These processes are not uncommon in the bones of the skull, and, according to Nélaton, they occur more frequently here than anywhere in the skeleton. The hyperostosis here, however, seems to involve mainly the external surface of the bones. It was formerly supposed that some inflammatory symptoms must accompany or precede this process, but we know that the thickening of bones may go on for an indefinite period after the cessation of all symptoms of inflammation. Cases have even been known to occur in which a cranial bone has continued to increase in size without any symptoms except those produced by its increase in bulk.

Macnamara makes a distinction between simple hypertrophy and hyperostosis. The former he defines as an increased development of the characteristic elements of bone-tissue, while the latter consists in an altered relation of these elements to one another. He also makes a comparison between chronic diffuse hyperostosis of bone, or sclerosis, as he calls it, where the density is very much increased,

and that condition of the cornea resulting from diffuse keratitis, basing it on the similarity of the anatomical arrangements of the soft elementary parts of both tissues. This comparison is ingenious, and seems quite a just one.

As a result of the change in size and shape of the bones of one orbit, the two orbits do not occupy a corresponding position, but one of them is found to be on a higher plane than the other. This difference is sometimes very great, and yet the functions of the eye are not interfered with. This is especially noticeable in the first of the two cases here given, which is an excellent example of pure, non-inflammatory hyperostosis, with absolutely no symptoms except the change in the orbit.

CASE I.—*Hyperostosis of the left side of the frontal bone, the left malar, the squamous portion of the left temporal, and possibly of the sphenoid.*

Dominick H., æt. 19; first seen Nov. 15, 1877. Patient well developed and robust; no abnormality except on left side of head and face; no strumous taint in the family, and he has never had any signs of syphilis. He has never seen well with the left eye, which he attributes to inflammation of the eyes in infancy. The change in the face began when he was nine years old, without any known cause, and has slowly and steadily increased, until now it results in an absolute deformity. This deformity consists in a very marked thickening and enlargement of the orbital arch and frontal boss of the frontal bone, of the external angle of the orbit, of the lower orbital margin, extending down upon the malar bone, and along the zygomatic arch, and of the hollow formed by the squamous portion of the temporal bone. The entire orbit is pushed downward and a little inward toward the median line; the eye is crowded over toward the inner wall of the orbit, and the cornea looks downward and inward. On passing the finger into the orbit, the outer wall is found to be thickened at the expense of the cavity, causing a suspicion that the sphenoid is involved in the process. The difference in level of the two orbits is so marked that the superior orbital margin of the left side is on the same plane with the inferior margin of the right orbit. There is a trifling degree of exophthalmus of the left eye, but the movements of the eye are normal in every respect, and there is no diplopia, and never has been any. This thickening has been of slow, imperceptible growth; there is no history of any injury, and there have never been any inflammatory symptoms. Periostitis and

its consequences are therefore excluded, and we may, hence, settle upon hyperostosis of the bones involved, of the general diffuse character, as the diagnosis. The most marked hyperostosis was in the frontal bone, which bulged forward and laterally like a dome, in the latter direction quite overhanging the zygomatic fossa. It gave the sensation of something extremely dense and compact, but both external surface and interior of the orbit were smooth, as far as the finger could judge. R. E., V.= $\frac{20}{30}$; L. E., V.= $\frac{20}{10}$; myopia, $\frac{1}{20}$ in each eye. Fundus of the left eye perfectly normal; small corneal macula just below the centre.

Hence, we may regard this case as pure hyperostosis or hypertrophy of bone-tissue, the periosteum in all probability not being involved. These cases are rare. Demarquay cites four cases of hyperostosis of bones of the skull, in which those forming the orbit were more or less involved; but in all there was a known cause, and in some the periosteum was thickened. Galezowski's explanation of these cases of pure hypertrophy, is that there is a feeble irritation which persists in the bone and is the quiet cause of the increase. Macnamara speaks of perverted nerve-action influencing the nutritive changes going on in the part, and thus inducing the abnormal growth in some cases, but admits that in instances of this kind the abnormal growth is confined to the periosteum.

Instances of periostosis joined to hyperostosis, as a result of chronic periostitis from injury, are more common than those of pure hyperostosis, and to this class the second case of deformity of the orbit belongs. As we understand the process, periostosis signifies a thickening of the periosteum, which may exist alone, without any hyperostosis. The latter probably occurs in the following way: A periostitis having been produced by some injury, it may be, after a time the underlying bone becomes inflamed. If the inflammatory process in the latter be arrested before caries sets in, the consequence will probably be a hyperostosis. To this process the bones of the orbit are said to be peculiarly liable. The result is well exemplified in the case now to be cited.

CASE II.—*Periostosis of the orbital portions of the frontal, malar and superior maxillary bones from traumatic periostitis, with probably some hyperostosis.*

Jean B. P., æt. 32, first seen April 25, 1878. Patient has had strabismus convergens of right eye since early childhood. No struma or rheumatism discoverable in the family. Patient has never

had syphilis or any venereal disease of any kind. Four years ago the patient received a severe blow on the left orbit and left side of the face, which bruised and lacerated the skin and muscles, but it was said produced no fracture. Since then there has evidently been a continuous chronic periosteal inflammation, with occasional acute exacerbations, brought on generally by exposure to cold. The periostitis extended all around the orbit, involving the frontal, malar, and superior maxillary bones, and has lately extended to the left nasal bone. The line of the nose deviates to the right side. The whole left orbit is displaced toward the right side and somewhat downward, but the displacement is mainly forward. There is some exophthalmus, though not to any great degree, but the plane of the opening of the left orbit is nearly half an inch in advance of that of the right orbit. The orbital margins are enormously thickened, particularly the lower, and at present very tender, owing to an acute periostitis. This thickening extends for some distance into the orbit, and narrows its capacity so that the movements of the eye are somewhat limited, though not enough apparently to occasion any diplopia. The thickening is so marked at the inner angle where the nasal bone takes part in the process, that a suspicion of hyperostosis, as well as periostosis, is strongly excited. Whether the actual antero-posterior diameter of the orbit is shortened, and whether the periostosis has extended to the sphenoid and ethmoid bones, it is impossible to say. In one sense the deformity is as great as in the first case, though there is not so much displacement of the orbit downward, but the squint of the other eye increases the apparent defect, by burying the cornea beneath the caruncle on the right side, and thus apparently narrows the distance between the orbits, in spite of the swollen left nasal bone.

This case had been under treatment for a long time, but with no apparent benefit, though the acute attacks of periostitis could easily be made to subside. There was no effect produced upon the chronic thickening of the periosteum, however, by any treatment that had been tried. Large doses of potassium iodide, repeated blistering and counter-irritation of various kinds, all proved valueless, and the patient finally withdrew from observation. Up to the last, vision remained good, S. $= \frac{20}{30} +$ on the affected side, and there was no diplopia. The fundus was found perfectly normal.

THE TREATMENT OF STRICTURES OF THE NASAL DUCT BY MEANS OF LARGE PROBES. By Samuel Theobald, M.D., Baltimore, Ind.

My experience in the use of the large lachrymal probes, which I have recommended in the treatment of strictures of the nasal duct, has, up to the present time, been so entirely satisfactory, that I am induced to add a few words in support of what I have heretofore said in their favor, and to present to the members of the Ophthalmological Society such additional testimony regarding their usefulness, as I have been enabled to gather since my last publication upon the subject, in Vol. VI. of the Archives of Ophthalmology and Otology. This I am the more inclined to do because of the rather prevalent scepticism which I have found to exist among ophthalmic surgeons as to the practicability of employing probes of such dimensions as I have advised.

This question of practicability, whether it would be possible to use in the treatment of lachrymal obstructions, to introduce through the divided canaliculus into the sac, the very large probes which my anatomical investigations had shown were necessary to fully dilate the nasal duct, I confess, at the outset, presented itself very strongly to my own mind, and so I am but little disposed to find fault with those who, without most convincing proof upon this point, entertain a like misconception. The knowledge obtained from their use during the past two years, however, enables me to state, not only that the introduction of the large probes is, in most cases, attended with no especial difficulty, but, more than this, that it is accomplished with greater ease, and requires less skill, than the passage of the smaller ones; just as, in urethral surgery, large sounds or catheters are introduced with greater facility than small ones. The difficult stage of the treatment is, indeed, passed when we have reached No. 10 or 12 of the series which I employ.[1] The pain caused by the large probes

[1] Sixteen probes comprise this series: the smallest, No. 1, measures ¼ mm., in diameter, the largest, No. 16, 4 mm. The difference between each succeeding number is ¼ mm., so that, by dividing the number of the probe by four, we have the diameter expressed in millimetres.

is not especially severe, nor have I seen any ill consequences result from the great distention of the divided canaliculus which is produced by their entrance into the sac.

Although the cases of stricture in which I have been able to properly carry out the thorough dilatation treatment have not been as numerous as I could wish, they nevertheless afford, I think, indubitable evidence in support of the claim which I have made as to the superiority of this over the confessedly unsatisfactory methods heretofore generally practised.

In the summer of 1877, I used for the first time a probe having a diameter of 4 mm., No. 16 of my series. Since then I have had under operative treatment twenty-four strictured ducts, in twelve of which I have used No. 16. Of the other twelve cases, in which No. 16 was not used, five, who were dispensary patients, discontinued their visits after one or two probings, and were subsequently lost sight of; two were from distant parts of the State, and were unable to remain under treatment except for a few days; one was a man, thirty years of age, who had lost the bones of his nose from syphilitic ulceration, and suffered with a chronic purulent inflammation of the lachrymal sac, and who, though he derived no benefit from the use of probes, wore for many months, with much comfort, and I believe still continues to wear, a leaden style, the size of No. 7 probe, which I inserted in July, 1877; another was a little girl, eleven years of age, recovering from an acute inflammation of the sac, who permitted me, under chloroform, to slit the canaliculus, and pass a No. 5 through the duct, but, relieved of her acute symptoms, would not submit to further operative treatment; another was a married woman, thirty-eight years of age, with stricture of the left duct of seven months' duration, associated with ozœna, who ceased her attendance after No. 12 had been used, and derived but temporary benefit from the treatment; another was a man, about forty years old, with stricture of the left duct, complicated with an acute inflammation of the sac, who, being relieved of this, and of the stillicidium which had annoyed him for some months, discontinued his visits, contrary to my advice, after No. 13 had been introduced, and who, I have recently ascertained, has still a slight blenorrhœa of the sac, although he tells me the overflow of tears has not returned; and, finally, the last of the twelve was a little fellow, four months old, with stricture of the left duct manifesting itself within a few days after birth by the appearance of stillicidium and blenorrhœa of the sac, in which case, although no benefit resulted from the use of a collyrium of sulphate of zinc, sup-

plemented by the division of the lower canaliculus, the passage but once of a No. 6 probe, facilitated by the administration of a few whiffs of chloroform, was followed by the complete disappearance of all symptoms of lachrymal obstruction. This patient is still under observation, the operation having been performed upon the 2d of the present month (July). On the 21st the eye remained quite well. In two, perhaps three, of these cases—the man with syphilitic destruction of the nasal bones, the little patient last mentioned, and the woman with stricture of the left duct associated with ozœna—the very large probes could not have been introduced ; but in the others probably the largest might have been used, and very different results obtained, had they remained sufficiently long under treatment.

In the twelve cases in which No. 16 was used, the treatment I have recommended—the prolonged use of very large probes, with the frequent application of an astringent collyrium—may be said to have been fairly tested, except, perhaps, in one instance, and so I have thought it worth while to append a brief description of each.

CASE I.—Mrs. H., æt. 66, German. Stricture of right duct, of twenty years' duration, associated with ozœna of many years' standing. Under treatment from April 20th till July 6th, 1877 ; No. 16 passed frequently, with only temporary relief, stillicidium returning within two months after use of probes was discontinued.

CASE II.—Same patient. Stricture of left duct, said to be of only a few months' duration. Treatment same as just described, and result similar.

CASE III.—Mrs. D., about 40 years of age, German, housewife. Stricture of right duct, with stillicidium of eight months' duration, and more recent blenorrhœa of sac. Treatment begun June 15. 1877. Probes introduced every third or fourth day till July 27th, when No. 16 was first used. The intervals were then gradually increased, so that between this date and Feb. 14, 1878, when the case was dismissed as cured, the canal was probed but nine times, No. 16 being used upon each occasion. A collyrium of sulphate of zinc and alum, one grain of the former and two of the latter to the ounce, was used in connection with the probing. This patient was seen in April last, fourteen months after operative treatment had been discontinued. The eye was then in a normal condition, the sac healthy, and the perviousness of the duct shown by the entire absence of stillicidium.

CASE IV.—J. L., æt. 28, American, driver of an ice-wagon.

Stricture of left duct, with stillicidium of eighteen months' duration, and present blenorrhœa of sac. Use of probes begun Jan. 22, 1877. Treatment discontinued May 10, 1878, when No. 16, which had been passed only at long intervals for some months previously, was introduced for the last time. The blenorrhœa of the sac in this case, as in the one last related, was very obstinate, but finally yielded to the same collyrium of zinc and alum. In May of the present year, twelve months after the treatment had been discontinued, I learned that the eye remained entirely well.

CASE V.—C. B. C., æt. 40, American, engineer. Stricture of left duct of thirteen years' duration. Had been previously treated by me with small probes, with only temporary benefit. Treatment begun June 24, 1877, with passage of No. 4. No. 16 was used first July 29th, and, having been passed eight times in all, was last introduced Oct. 28, 1877. Since then there has been no return of trouble. A short time since he proved to me the perviousness of the duct by closing his nose and blowing air freely through it.

CASE VI.—Same patient. Stricture of right duct of about same duration as that in left, with similar history of previous unsuccessful treatment by means of small probes. The tendency to recontraction having been much more persistent upon this side than upon the other, the occasional introduction of No. 16 has been continued up to the present time. When last seen, in the latter part of April, although the canal had been probed but three times during the preceding six months, it was found to be quite pervious, and No. 16 was introduced without difficulty.

CASE VII.—Mrs. S., æt. 44, German, housewife. Stricture of left duct of ten years' duration, with long-standing blenorrhœa of sac. Was under treatment from Oct. 26, 1877, till Aug. 9, 1878, No. 16 having been introduced twenty-eight times. The improvement in this case was only temporary. On the 6th of the present month I examined the eye, and learned that the stillicidium and blenorrhœa had returned. Throughout the whole treatment the strictures had exhibited an obstinate disposition to recontraction, and the ultimate result was not a surprise to me.

CASE VIII.—Florence G., æt. 7. Stricture of left duct, with blenorrhœa of sac, said to have resulted from a blow by a hard rubber ball two months previously. As the treatment of this case was interrupted by the patient being compelled to leave town after No. 16 had been introduced but a few times, and before the inflammation of the sac had disappeared, the return of the strictures, which subse-

quently took place, is what might have been expected, and so the merits of the large probes were, in this instance, not fairly put to the test. As showing, however, the possibility of using, even in so young a subject, the largest of the series, the case is one of interest. A few inhalations of a mixture of chloroform and ether quieted the patient momentarily, and rendered the introduction of the probes painless and comparatively easy of accomplishment.

CASE IX.—Mrs. M., æt. 46, wife of a well-to-do merchant. Stricture of left duct, with stillicidium of two years' duration. Treatment begun, by passing No. 5, December 13, 1877. No. 16, which was used for the first time January 26, 1878, was introduced six times between that date and May 13th following, when operative treatment was discontinued. Upon examining the eye a few days since, I found the sac in a healthy condition, and learned that she had had no return of the stillicidium.

CASE X.—Mrs. Mary S., æt. 25, seamstress. Stricture of right duct, with blenorrhœa and stillicidium of three months' duration. Treatment begun October 11, 1878. No. 16 being first introduced November 6th. Although the stillicidium and blenorrhœa have entirely disappeared, I still continue to pass No. 16 every three or four weeks, in order to guard against the possibility of recontraction. A successful issue in this case is, I think, assured.

CASE XI.—Mrs. S., æt. 24, German, seamstress. Stricture of right duct, with stillicidium of two years' duration, and recent blenorrhœa of sac. Treatment commenced March 24, 1879. No. 16 introduced but twice. The duct was probed last on May 12th, when, being no longer troubled with the stillicidium, and the blenorrhœa having disappeared, she, contrary to my advice, discontinued her visits, but subsequently persevered in the use of a two-grain solution of alum which I had directed for her. On the 18th of the present month I could not discover that the early discontinuance of the probing had, in this instance, been detrimental to the result. The sac was found to be healthy, there was no stillicidium, and the perviousness of the duct was made manifest by her ability to blow air through it.

CASE XII.—B. McG., æt. 48, Irish, laborer. Stricture of right duct, with stillicidium of four months' duration and blenorrhœa of sac. This patient has been under treatment only a few weeks, since May 26th, and No. 16 has been introduced but twice. He is using a two-grain solution of alum as a collyrium, three times a day, and is

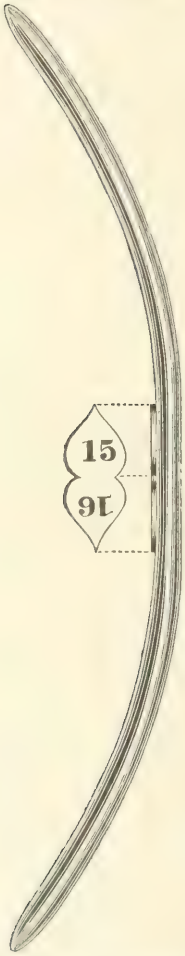
improving in a most satisfactory manner; but of course it is, as yet, too early to speak with certainty of the ultimate result.

Disregarding Case VIII., in which the treatment was interrupted, we find that in three of the remaining eleven cases the use of the large probes was productive of but temporary benefit, two of these, Cases I. and II., being in the same subject, an old woman suffering with ozœna of long standing, and the other, Case VII., being a stricture of ten years' duration; in five, Cases III., IV., V., IX., and XI., a complete cure was obtained; in two, Cases VI. and X., a good result is, I think, assured, although they have not yet been dismissed as cured; and in one, Case XII., in which the treatment has been but recently begun, the improvement up to this time gives promise of a successful issue—a more favorable showing, I venture to believe, than would have been obtained in these same cases had the strictured ducts been only partially dilated by the small probes commonly used.

As to the necessity of continuing the use of the probes for so long a time, as was done in several of these cases, I am sure it is, as a rule, the safest course, although in some instances it may be superfluous. Certainly it should not be stopped so long as blenorrhœa of the sac persists, or the strictures show a disposition to recontract. In the latter case their more frequent introduction is indicated.

Unless the question of time is an important consideration, in the early stages of the treatment, I think it is best that the probes should be passed every other day. After No. 16 (or the largest which may be admissible) has been used a few times, it will not be necessary to do this more frequently than once a week; and when the inflammation of the sac has subsided, and the easy passage of the probe shows that the strictures are not prone to reform, once a fortnight, and afterward every three or four weeks, will be sufficiently often. When, in order to save time, it is necessary to do so, the probing can be repeated daily, and even at one visit a second probe may be introduced, though this is not a practice to be commended. In general, No. 5 is the most convenient size to begin with; the smaller probes may be required to dilate the entrance into the sac, and are useful in obstructions of the puncta and canaliculi. Sometimes, in ascending the scale, when we have reached a probe which seems so tight as to lead to the conviction that the limit of size has been reached, we shall, after introducing this upon several successive occasions, find that we may easily pass on to the next of the series. After dividing the canaliculus it occasionally happens that the first introduction of

the probe into the sac is very difficult of accomplishment; by being content to wait until the next day to complete this part of the operation, I have been more than once rewarded by gaining a ready entrance.



The various appliances for injecting the sac and duct, such as slender-pointed syringes, hollow probes, etc., which can be used only by the surgeon, seem to me of but little value. A simple pipette, with which the patient may thrice daily, after emptying the sac by pressure, instil into the inner corner of the eye a few drops of a two-grain solution of alum, a one-grain solution of sulphate of zinc, or of the two in combination, is, in my opinion, of far more service than they.

In order that the large probes may be used with satisfaction—indeed, I may say, used at all—it is necessary that their ends should not be too blunt, but, as I have said before, should be shaped like the smaller extremity of an olive, though somewhat more pointed. Although I have, heretofore, laid much stress upon the importance of this, and have taken no little pains, in some instances, to instruct the instrument-makers in regard to the proper form to be given to them, I have not been as successful as I could wish in having my suggestions accurately carried out. In some cases the probes have been made too blunt, or too suddenly bevelled off, so as to leave a clumsy shoulder, while in others, so absurdly sharp that to use them would have been, at least, unnecessarily painful, if not actually hazardous. When they are properly shaped, without this shoulder and with the point not too sharp, as those are which I show you, they will glide with ease into the sac, and pass without difficulty through the duct. They are made either of silver,[1] or of copper, or Ger-

[1] The larger probes, from 9 to 16, should be made of pure silver.

man silver nickel-plated. The latter are, of course, less expensive, and, because of the superior smoothness of the nickel surface, are introduced with rather more facility than the silver ones, which, however, have the advantage of being more durable, and of being easily modified as regards the shape of their points, should they not come from the maker of the desired form.

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